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WASTE SOURCE STUDY AND REVIEW OF WASTE TREATMENT AND CONTROL PRACTICES, MONSANTO CHEMICAL COMPANY, PENSACOLA, FLORIDA

M. D. Lair, et al

Environmental Protection Agency
Athens, Georgia

May 1972

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REPORT TO THE CONFEREES OF THE THIRD SESSION OF THE
CONFERENCE IN THE MATTER OF POLLUTION OF THE
INTERSTATE WATERS OF THE ESCAMBIA RIVER BASIN
(ALABAMA-FLORIDA) AND THE INTRASTATE PORTIONS
OF THE ESCAMBIA BASIN WITHIN THE STATE OF FLORIDA

WASTE SOURCE STUDY
AND
REVIEW OF WASTE TREATMENT AND CONTROL PRACTICES
MONSANTO CHEMICAL COMPANY
PENSACOLA, FLORIDA

May, 1972

Environmental Protection Agency
Surveillance and Analysis Division
Athens, Georgia

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The planning and operation of this project was carried out under the supervision of Mr. B. H. Adams, Chief, Engineering Services Branch.

Mr. M. D. Lair was project engineer and principal author of this report.

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INTRODUCTION

This report presents an evaluation of waste treatment and waste control practices at the Monsanto Chemical Company nylon plant at Pensacola, Florida. The study, conducted during March 7-14, 1972, by the Environmental Protection Agency, Region IV, Surveillance and Analysis Division, was requested by the Conferees at the Third Session of the Federal-State Enforcement Conference in the Matter of Pollution of the Interstate Waters of the Escambia River Basin (Alabama-Florida) and the Interstate Portion of the Escambia Basin within the State of Florida, January 24-25, 1972.

The objectives of the studies outlined in this report are to:

- Characterize and quantify all plant wastes discharged by Monsanto into receiving waters;
- Evaluate and document current waste treatment and control practices, and
- Propose alternatives to utilize the best available technology for waste treatment.

The assistance and cooperation of the Florida Department of Pollution Control, Escambia County Health Department, and the Monsanto Chemical Company are gratefully acknowledged.

FINDINGS

1. The waste source sampling phase of this study was conducted at the Monsanto Chemical Company, Pensacola, Florida, during March 7-14, 1972. Samples were collected and waste flow was measured (or supplied by Monsanto) at twenty-six sampling locations including dilute in-plant and effluent waste streams and concentrated waste streams discharged to deep well disposal.

2. The bulk of Monsanto's pollutants (concentrated process waste streams) are collected in a separate sewer system and are discharged into a subsurface disposal site in the Floridan aquifer through two deep injection wells (these wells discharge into the Floridan aquifer at a depth of 1,400 feet). During this study, 2,460 gpm of acidic (pH 2.6) wastes containing the following waste loads were pumped to the subsurface disposal site:

Parameter	Waste Load (lbs/day)
Five-Day Biochemical Oxygen Demand (BOD_5)	442,000
Chemical Oxygen Demand (COD)	583,000
Total Organic Carbon (TOC)	159,000
Total Phosphorus (Total P)	324
Total Nitrogen (Total N)	56,000
Total Residue	296,000
Non-Filterable Residue (NFLT. Residue)	562

Numerous metals, including total chromium (18 lbs/day), copper (150 lbs/day), and vanadium (118 lbs/day), are disposed of through deep well injection.

A number of organic compounds, including valeric acid (500 mg/1), cyclohexanol (100 mg/1), caproic acid (220 mg/1), adiponitrile (320 mg/1) and adipic acid (3.7 mg/1), were present in the injected wastes. In addition, 50 to 75 other organic compounds -- primarily higher molecular weight alcohols and ketones -- were detected at estimated concentrations of 0.05-5.0 mg/1. Approximately 194 lbs/day of phenols and 8,200 lbs/day of oil and grease were also disposed of through the deep well system.

3. Most of Monsanto's dilute wastewaters are discharged into the Escambia River from the main outfall (22,600 gpm of the 23,400 gpm discharged). The comparison of waste loads established by the Federal-State Enforcement Conference (implementation date -- December 31, 1972) with 1969 and present study results are as follows:

	Waste Load (lbs/day)			Waste Load Reductions (Percent)	
Parameter	Conference Recommendations	1969 Study	Present Study	Conference Recommendations	Since 1969 Study
BOD_5	605	10,100	1,160	94	88.5
TOC	--	3,900	850	94	78.2
Total N	248	3,200	668	94	79.1
Total P	46	421	60	90	85.7
Total Residue	--	--	26,500	--	--
NFLT Residue	--	--	1,330	--	--

A polychlorinated biphenyl compound, Arochlor 1254 was detected in the main outfall at a concentration of 0.2 µg/1 (a waste load of 0.05 lbs/day). Another organic compound, isooctylphthlate,

was detected in both outfalls (0.74 mg/1 in the main and 0.80 mg/1 in the north outfall) resulting in a total discharge of 207 lbs/day of this compound. Several other phthlates were present in both outfalls at concentrations approximately 20 times lower than the isooctylphthlate.

Sixty-three lbs/day of total chromium (59 lbs/day in the main effluent) and 26 lbs/day of zinc (22 lbs/day in the main effluent were also discharged during the study.

4. The reduction in dilute waste stream discharges into the Escambia River by the Monsanto Chemical Company since the 1969 Federal study was due exclusively to in-plant changes and process modifications, including:

   - Process modifications to reduce phosphorus discharges.
   - Waste collection system modifications to direct nitrogenous and carbonaceous materials to deep well disposal.
   - Replacement of 20 barometric condensers by surface condensing units.
   - Termination of the use of polychlorinated biphenyls within the plant and abandonment of the original main outfall to prevent the resuspension of PCB's contained in the outfall sediment.
   - Conversion of one process waste holding pond for use as a secondary treatment lagoon for sanitary wastes.

5. Monsanto recycles wastewaters within the plant. The following data supplied by Monsanto detail the quantities of wastewaters reportedly reused by Monsanto as well as their base loads expressed in pounds per day:

Parameter	Waste Load Generated	Reused, Recovered or Recycled	Discharged to Deep Well Disposal	Discharged into Escambia River
TOC	306,000	110,000	194,000	2,000
Total N	120,000	93,400	26,000	600
Total P	4,000	3,600	350	50

6. The following in-plant changes to reduce pollutants in dilute waste discharges into the Escambia River are projected for 1972:

- Removal of four additional barometric condensers.
- Additional modifications in the waste collection system to divert additional waste streams to deep well disposal (although the capacity of this system is rapidly being approached).
- Additional curbing and diking of storage and process areas to contain spills.
- Completion of the secondary treatment pond, with chlorination, to provide 90 percent 5-day biochemical oxygen demand removal for sanitary wastes.

Studies are currently ongoing or will be implemented in the near future by Monsanto for in-plant changes and/or process modifications which will further reduce pollutants in dilute wastewater streams.

7. Twenty-three inplant waste streams were sampled during the study to determine treatability of dilute waste streams. Except for the cyclohexane oxidization area, study results indicated that none of the in-plant waste streams or effluent discharges contained pollutants in concentrations high enough to be removed by conventional waste treatment techniques. Control or elimination of waste discharges

at their source, or diversion of additional point source waste discharges to deep well disposal, appear to be the only feasible abatement alternatives available to Monsanto for further control of dilute waste discharges. Study results disclosed that the following in-plant dilute waste streams may be subjected to additional source control and should be investigated by Monsanto in future abatement efforts:

EPA Sampling Station	Waste Stream Source
M-3	North outfall and possible dump drainage
M-4	Yarn plant
M-7	Water plant regeneration pond
M-8	Cyclohexane oxidation, powerhouse and hexamethylene diamine areas
M-9	Cyclohexane oxidation area
M-11	Cerex and Astroturf manufacturing and storm drainage
M-14	Cyclohexane oxidation area
M-15	Hexamethylene diamine area
M-17	Adipic acid area

8. Water plant regeneration wastes from the neutralization pond were alternately highly caustic or acidic. Since the pH in the main outfall varies from 3.6 to 9.5, obviously, the neutralization pond does not provide satisfactory pH control for these wastes.

9. To comply with Florida's secondary treatment provision for deep well disposal, the Monsanto Chemical Company is currently investigating the following treatment methods for individual concentrated process waste streams:

- submerged combustion
- incineration
- carbon adsorption
- reverse osmosis
- ion exchange
- recycling and recovery
- conventional treatment for individual waste streams or combinations of waste streams whose waste concentrations are not high enough for other treatment methods.

NOTE: The existing EPA policy on the disposal of wastes by subsurface injection states that:

"The Environmental Protection Agency is opposed to the disposal or storage of wastes by subsurface injection, without strict controls and a clear demonstration that such wastes will not interfere with present or potential use of subsurface water supplies, contaminate interconnected surface waters, or otherwise damage the environment. Controlled subsurface injection may be acceptable where: (1) It has been demonstrated to be the best waste disposal alternative in terms of overall environmental protection. Subsurface injection should be recognized as an essentially temporary solution, subject to development of better alternatives, and is to be minimized in its use for the disposal or storage of wastes wherever possible. (2) It is utilized in connection with overall planned management of groundwater or related resources."

RECOMMENDATIONS

1. The State of Florida and the Federal-State conferees should issue a single unified set of requirements for the abatement of Monsanto's wastewater discharges into the Escambia River.

2. The Monsanto Chemical Company should submit to the conferees by September 1, 1972, a detailed report on current investigations into point-source waste controls, waste collection system modifications, and process modifications to reduce pollutants in wastewater discharged into the Escambia River. This report should contain:

   - Specific in-plant control methods or modifications.
   - The specific or estimated amounts of pollutants which will be removed from Monsanto's discharge when the control method or modification is implemented.
   - A specific implementation schedule for proposed waste control methods or modifications.

3. The Monsanto Chemical Company should install an adequate pH control system for water plant regeneration wastes which would insure that Monsanto's effluent discharge into the Escambia River would be within a pH 6.0 to pH 8.5 range.

4. The conference should maintain the previously recommended maximum effluent loads for Monsanto's Escambia River discharges. However, it is recommended that these maximum loadings apply as seven-day average values. It is further recommended that average daily waste loads not exceed twenty-five percent of the seven-day average values. The following effluent criteria would then apply:

Parameter	Maximum Monsanto Effluent Loadings (lbs/day) 7-Day Average Values	Maximum Daily Values
5-Day Biochemical Oxygen Demand	605	760
Total Nitrogen	248	310
Total Phosphorus	46	60

5. If future EPA and/or State of Florida deep well disposal policy conflicts with present practices at Monsanto, new treatment recommendations should be developed.

PREVIOUS INVESTIGATIONS AND ENFORCEMENT ACTIONS

ORIGINAL STUDY

The Federal Water Pollution Control Administration[1/] conducted a water quality study of the Escambia River and Bay at the request of the Governor of the State of Florida during September-October, 1969. (1) The study report concluded that the entire portion of Escambia Bay north of the L&N Railroad bridge was in a state of accelerated eutrophication, and that minimum dissolved oxygen levels of 4.0 mg/l, required by the State of Florida, were being violated in nearly half of the bottom waters of the bay. This degraded water quality was attributed to the poor flushing characteristics of Escambia Bay and the discharge of carbonaceous, nitrogenous and phosphoric materials by numerous industries and the Pensacola Northeast Sewage Treatment Plant. The Monsanto Company discharge was cited as a major contributor of carbonaceous wastes, a principal contributor of nitrogenous wastes and phosphorus into Escambia Bay. The report attributed the following waste loads to Monsanto during the 1969 study:

Waste Loads (lbs/day)						
		Nitrogen			Phosphorus	
BOD_5	TOC	TKN-N	NH_3-N	NO_2-NO_3-N	Total	Ortho
10,100	3,900	1,870	1,100	1,330	421	264

The report recommended that Monsanto's waste discharge receive waste treatment sufficient to reduce carbonaceous materials by 94 percent, nitrogenous materials by 94 percent, and phosphorus by 90 percent. These reductions would permit the following allowable waste discharges for Monsanto.

1/ Now the Environmental Protection Agency.

Waste Loads (lbs/day)						
		Nitrogen			Phosphorus	
BOD_5	TOC	TKN-N	NH_3-N	NO_2-NO_3-N	Total	Ortho
605	282	102	66	80	46	29

The report also cited the Monsanto waste discharge as causing increased temperatures in the Escambia River and recommended that this thermal pollution be abated by January 1, 1973.

FEDERAL-STATE ENFORCEMENT CONFERENCES

A Federal-State "Conference in the Matter of Pollution of the Interstate Waters of the Escambia River Basin (Alabama-Florida) and the Intrastate Portions of the Escambia River Basin Within the State of Florida" was held January 21-22, 1970, at Gulf Breeze, Florida.

The Federal-State conferees concluded that "the entire upper section of Escambia Bay north of the Louisville and Nashville Railroad Company bridge is in a state of accelerated eutrophication as shown by unstable dissolved oxygen variations resulting from algal activity; high carbon, nitrogen, and phosphorus concentrations; and oxygen demanding sludge deposits." (2) The conferees further concluded that "the lower section of the bay south of the Louisville and Nashville Railroad Company bridge also has degraded water quality, primarily due to sludge deposits." The conferees concluded that these conditions were the result of the waste discharges and circulation problems outlined in the Federal report.

The conferees recommended that the industries and municipalities (including Monsanto) reduce the amounts of carbonaceous, nitrogenous, and phosphoric materials discharged into Escambia Bay and River by 94 percent, 94 percent and 90 percent, respectively. The conferees also recommended that Monsanto abate by January 1, 1973, the thermal pollution of the Escambia River resulting from their heated liquid discharge.

The second session of the Federal-State Enforcement Conference was held in Pensacola, Florida, February 23-24, 1971. The conferees modified the original recommendations somewhat by imposing effluent loads associated with the previously recommended reductions of carbon, nitrogen, and phosphorus recommended for municipal and industrial effluents.(3) These effluent limits for Monsanto expressed as maximum effluent loads were: BOD_5 - 605 lbs/day, total nitrogen - 248 lbs/day, and total phosphorus - 46 lbs/day. The conferees recommended that these waste limitations be met by December 31, 1972. The conferees also recommended that if these requirements prove to be excessive, Monsanto must develop a plan for completely removing their discharge from the bay. Monsanto, along with the other industrial and municipal waste dischargers, was directed to submit plans for maximum feasible reductions of carbonaceous material by February 15, 1972. The conferees also acknowledged the state of Florida's enforcement action against Monsanto for the release of polychlorinated biphenyls.

The third session of the Federal-State Enforcement Conference was held in Pensacola on January 24-25, 1972. The conferees expressed dissatisfaction with Monsanto's plans to meet previous conference recommendations as well as the continued presence of polychlorinated biphenyls in Monsanto's discharge.(4) The conferees reaffirmed previously recommended reductions and discharge limits for carbonaceous, nitrogenous, and phosphoric materials. These reductions are scheduled to be accomplished by December 31, 1972. The recommendation of the second session of the conference concerning the submission of plans for maximum reductions of carbonaceous materials by Monsanto and others by February 15, 1972 was repeated. The conferees recommended EPA conduct

in-plant waste source, thermal pollution, and restoration studies of Escambia Bay.

STATE OF FLORIDA ENFORCEMENT ACTIVITIES

State enforcement action (Florida Pollution Control Board) dates back to mid 1969 when Monsanto was ordered to provide 90 percent minimum treatment[1/] to their waste discharges (5).

In 1969, an industrial fluid containing polychlorinated biphenyls (PCB's) leaked into Monsanto's main outfall. Although Monsanto discontinued use of this fluid, residual PCB was detected in the plant effluent. It was hypothesized that PCB's were being resuspended from sediments contained in the main plant outfall sediment. The State of Florida served a notice of violation on Monsanto on January 27, 1971, regarding the PCB problem. Monsanto entered into a consent agreement with the State of Florida and abandoned this outfall shortly after the notice of violation was served.

During March 1972 the Florida Department of Pollution Control issued orders to Monsanto for control of their waste discharges (6). These orders provided that Monsanto:

- Would not allow rainfall to cause an overflow of wastes into the Escambia River.
- Would not use, possess, or allow polychlorinated biphenyls on the premises and would continue to monitor the level of PCB's in its intake and discharge.

1/ No definition of 90% minimum treatment was given in the referenced report.

The orders also provided that within 30 days of issuance of the order, Monsanto must submit an interim report containing a preliminary plan of action concerning:

- Sound in-plant source control and wastewater management program that would completely eliminate wastewater and thermal discharges from Escambia River and Bay.
- Provide 90 percent treatment to wastes to be disposed of by deep well disposal by January 1, 1973.

Within 90 days of the issuance of the order, Monsanto was ordered to submit a completed comprehensive plan which would provide for:

- Complete removal of all liquid wastes discharged into the Escambia River by January 1, 1973, or if this is not feasible a comprehensive report detailing all alternatives;
- If it is not feasible, the reduction of discharges is to be at the level recommended by the conferees, i. e., BOD_5 - 605 lbs/day, Total Nitrogen - 248 lbs/day, and Total Phosphorus - 46 lbs/day maximum, and
- Secondary treatment of all wastes discharged to the disposal well.

PLANT DESCRIPTION AND MANUFACTURING PROCESS

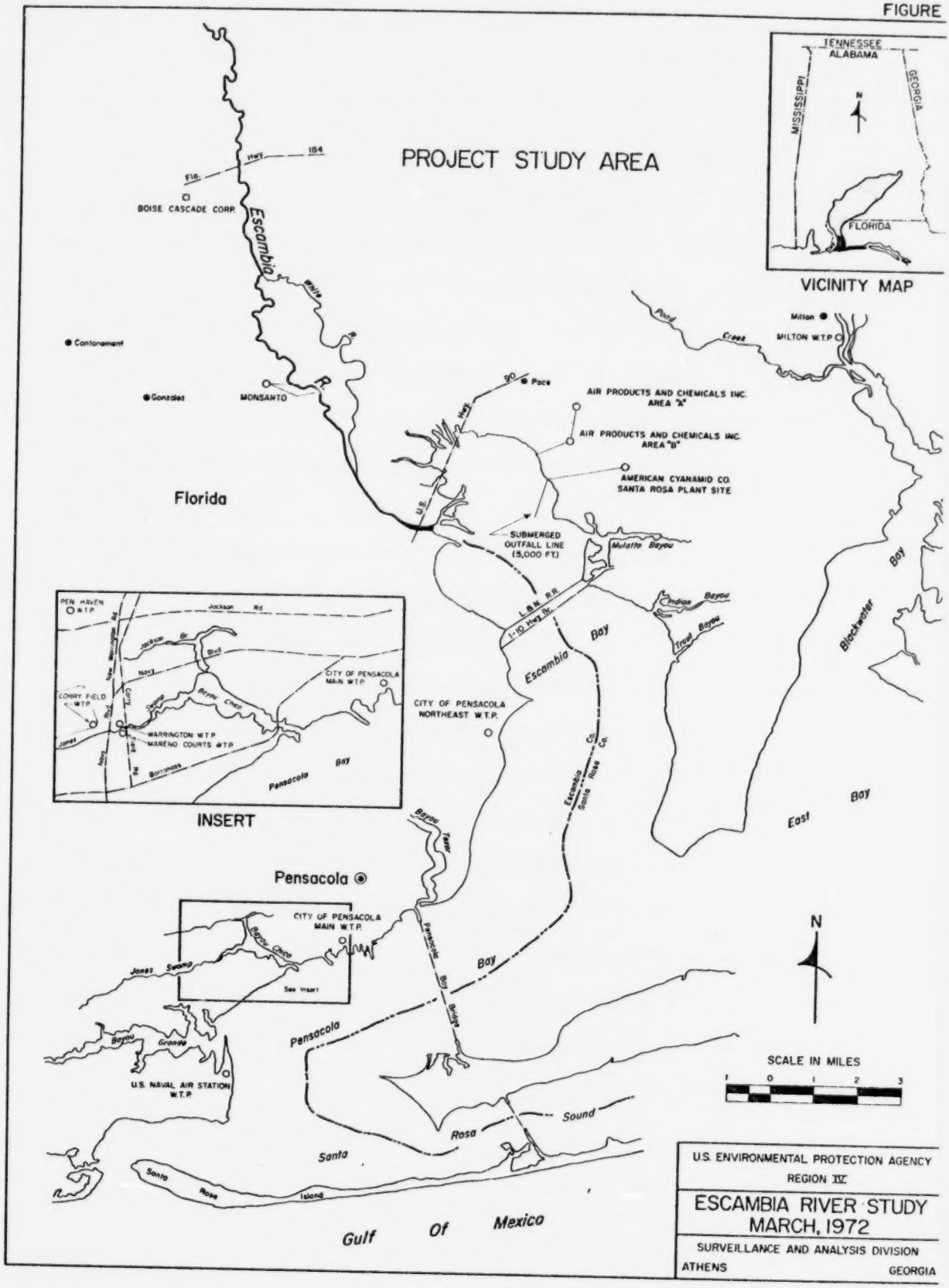
The Monsanto Chemical Company plant at Pensacola, Florida is the largest wholly integrated nylon manufacturing facility in the world. The plant is located 7 miles upstream of Escambia Bay on the Escambia River (Figure 1). The manufacturing facilities consist of 25 separate buildings on 2,000 acres of land with a total employment of approximately 6,000 people. In addition to nylon manufacturing areas supporting utilities and a corporate research and development group is located at the plant site. Astroturf[1/] and Chemgrass[1/] manufacturing units are also located on the premises.

The principal products produced by Monsanto include nylon intermediates (adipic acid and hexamethylene diamine) and finished nylon (nylon yarn and Cerex[1/] bonded nylon fabric). Semi-commercial quantities of Chemgrass[1/] and Astroturf[1/] are also produced.

The basic chemical manufacturing process consists of the manufacture of Nylon 66 and nylon intermediates from cyclohexane, ammonia, air and natural gas. This manufacturing process is shown in schematic form on Figure 2. Nylon intermediates are used for the production of nylon at Pensacola and are shipped to other plants for final processing. Other manufacturing steps include nylon polymerization, spinning of nylon yarn, nylon finishing operations and packaging. Astroturf[1/] and Chemgrass[1/] operations consist of the manufacture of these products from polyethylene which is produced elsewhere.

1/ Monsanto trade marks.

FIGURE



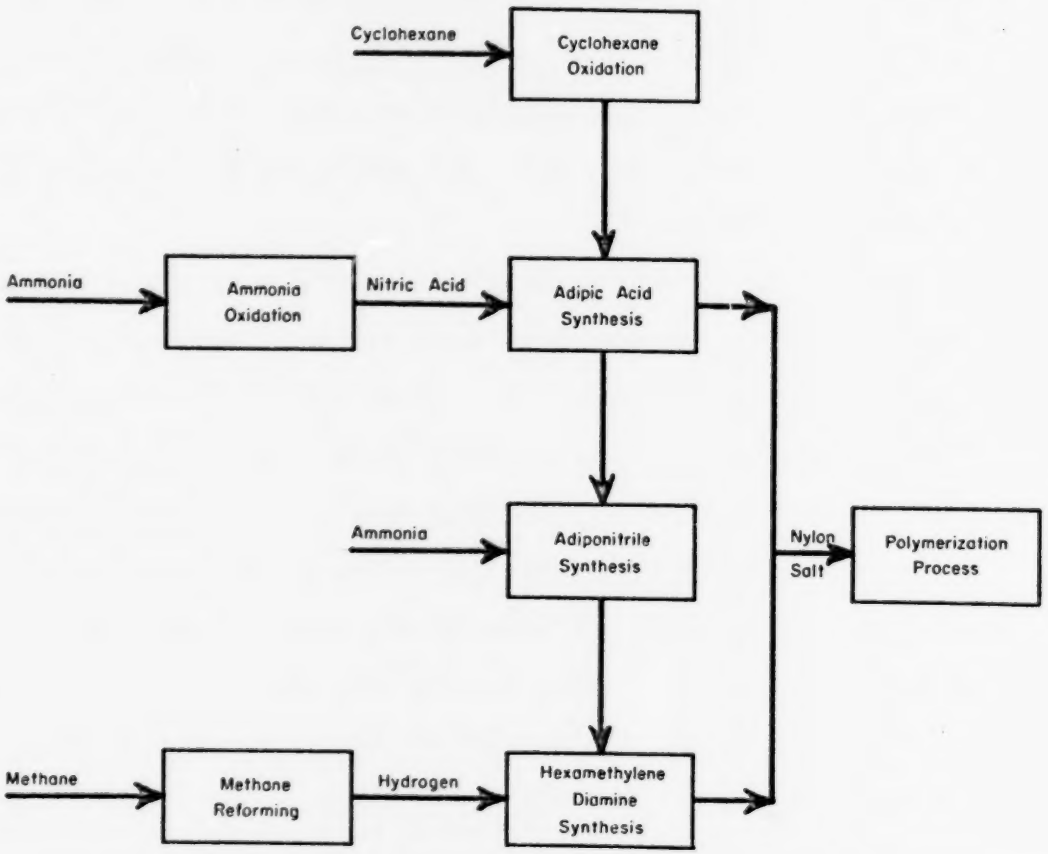
U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV

ESCAMBIA RIVER STUDY
MARCH, 1972

SURVEILLANCE AND ANALYSIS DIVISION
ATHENS GEORGIA

FIGURE 2

MONSANTO CHEMICAL CO.
NYLON MANUFACTURING PROCESS



NOTE: Drawing Supplied by the Monsanto Co.

U.S ENVIRONMENTAL PROTECTION AGENCY
REGION IV

ESCAMBIA BAY STUDY
MARCH, 1972

SURVEILLANCE AND ANALYSIS DIVISION
ATHENS GEORGIA

WASTE TREATMENT AND CONTROL PRACTICES[1/]

WASTE ABATEMENT PRACTICES PRIOR TO 1969

The Monsanto nylon manufacturing plant began operation in December, 1953. The original waste treatment and control devices provided by Monsanto at that time included two process waste holding ponds (7 and 17 acres), incineration for one highly organic waste stream and primary sewage treatment with chlorination for sanitary wastes. The holding ponds provided 30-40 days retention for process wastes during low Escambia River flow and some neutralization through mixing of acidic and alkaline wastes. The primary purpose of this waste control system was to maintain minimum dissolved oxygen levels of 3.5 mg/l in the Escambia River (State of Florida requirements).

A major plant expansion in 1955 required that additional waste treatment facilities be provided for process wastes. A bioxidation waste treatment plant was placed in operation in 1957. (7) The bioxidation treatment plant was designed for a 500 gpm hydraulic load and 70 percent 5-day biochemical oxygen demand (BOD_5) removal. Actual BOD_5 removals up to 90 percent at an 800 gpm hydraulic loading were obtained. The process wastes were diluted 1:3 with Escambia River water to reduce BOD_5 concentrations to a treatable level. Although BOD_5 removals by the bioxidation facility were adequate, Monsanto did not develop a satisfactory sludge handling facility, and this problem eventually contributed to the abandoment of this facility. A submerged combustion unit was also installed in 1957 to treat concentrated wastes from one process waste stream.

1/ The majority of the information presented in this section was obtained by M. D. Lair and B. H. Adams (EPA) from Monsanto Company officials in a meeting held in Pensancola, Florida, April 19, 1972.

In 1958, a settling pond was installed to remove suspended solids from one waste stream. An additional holding pond was also installed during 1958 to hold treated wastes during critically low Escambia River flow. The emergency holding pond and the two previously constructed holding ponds were used as equalization basins for the bioxidation system.

Additional waste treatment facilities were dictated by increases in nylon production capacity, the inability to solve the bioxidation sludge handling problem, and the inability of the Escambia River to absorb additional waste discharges (even with secondary waste treatment). Monsanto experimented with liquid ion exchange, submerged combustion and incineration for some individual waste streams. Spray irrigation and a trickling filter were experimentally investigated for the total waste stream. (8) However, these treatment alternatives were rejected by Monsanto. A liquid ion exchange process was installed on one waste stream for metal recovery to permit recycling of this waste stream; this unit is still operational.

In 1961, the feasibility of deep well disposal of process wastes was investigated. The initial interest in deep well disposal was generated by geohydrological investigations of Escambia and Santa Rosa Counties by the U. S. Geological Survey (USGS). These studies indicated that it might be feasible to inject Monsanto process wastes into the lower limestone formation of the Floridan Aquifer. This formation contains water too saline for potable use (7,900 mg/l chloride) and the usable shallow aquifers overlying this formation were protected by the Pensacola clay (500 feet thick) and bacatunna clay (219 feet thick) aquicludes as well as the upper limestone formation of the Floridian Aquifer. (9) In cooperation with the U. S. and Florida Geological

Surveys, a test well was drilled in 1963. The test well was drilled into the lower limestone formation to a depth of 1,390 feet. A casing was installed and an open hole was drilled through the formation to a total depth of 1,808 feet. Two monitoring wells were constructed at the same time. A shallow monitor well, open to the upper limestone of the Floridan aquifier, was constructed 100 feet from the injection well to check for leakage into the upper limestone through the lower Bacatunna clay member. A deep monitor well, open only to the receiving formation, was constructed 1,300 feet south of the injection well. These monitor wells were checked periodically by the U. S. Geological Survey in a continuing monitoring program. The effects of the injected waste were evident at the deep monitor well, 1,300 feet away, by mid 1964.

These test wells were operated experimentally from 1963 to 1965. During this time, injection rates increasing from an initial 600 gpm to more than 1,200 gpm. Wastes not injected continued to be treated by the bioxidation process and incineration. In 1965, a second injection well was constructed 1,300 feet west of the initial well and placed into service. Initially, wastes were partially neutralized with ammonia; however, this practice was abandoned in April 1968. During the experimental phase of injection, wastes were filtered through sand to remove suspended solids. Filtration proved unnecessary and was not used in actual practice. From 1966 through 1968, the combined injection rate averaged about 1,500 gpm. Present injection rates exceed 2,000 gpm. In February 1969, waste concentrations at the deep monitoring well approached those of injected wastes. It was of no further use and the well was sealed with cement grout. In 1970, two additional deep monitor wells were drilled into the receiving formation 1.5 miles south and 1.9 miles north

of the injection site (10). Injected wastes have not been detected in these wells.

The bioxidation plant was phased out in 1965 after completion of the second injection well. The submerged combustion unit was phased out in 1963 after process modifications rendered the concentrated waste stream untreatable by this process. The incineration process was phased out during the period 1965-1968 by diverting some waste streams to deep well disposal and other more concentrated waste streams to the powerhouse for use as fuel.

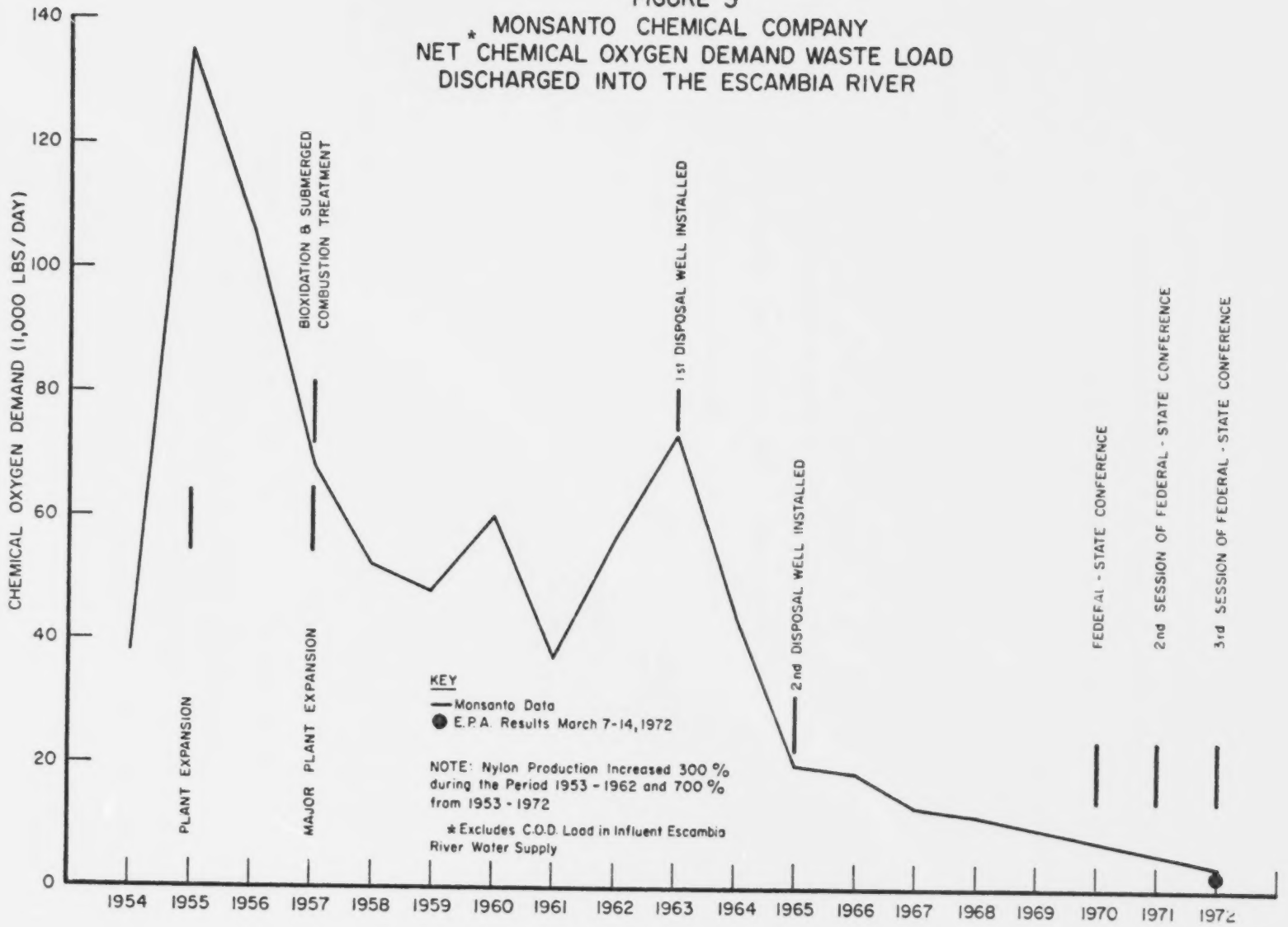
Process modifications and in-plant changes to reduce waste concentrations and volumes have been an ongoing program at Monsanto since the inception of the plant. Many of these changes are of a proprietary nature but include:

- Evaporation, filtration, crystallization or distillation to reduce amount of waste materials or convert them for use as powerhouse fuel.
- Actual changes in process and/or raw materials to reduce waste concentrations and volumes.

These modifications and in-plant changes are reflected in the reduced amount of COD discharged from the plant between the initial plant operation and the present time (Figure 3). Despite an increase of 300 percent in production between 1953-1962, significant reductions in waste volumes occurred between installations of waste treatment equipment. Production has increased 700 percent from 1953-1972.

FIGURE 3

* MONSANTO CHEMICAL COMPANY
NET CHEMICAL OXYGEN DEMAND WASTE LOAD
DISCHARGED INTO THE ESCAMBIA RIVER



WASTE ABATEMENT PRACTICES SINCE 1969

In 1969, just prior to the first federal study of Escambia Bay, Monsanto began to study methods for the reduction of nitrogen and phosphorus in dilute waste streams. Company efforts were intensified after the Federal-State Enforcement Conference recommendations of 1970, 1971, and 1972 which required substantial removals of nitrogen, phosphorus and carbonaceous materials from wastewaters entering the bay. These wastewaters were not the concentrated wastewaters being discharged to deep well disposal but were condensate, pump seal flushwater, barometric condenser discharges and other dilute waste streams discharged into the Escambia River.

During the summer of 1969, process modifications were made to reduce the quantities of phosphate in Monsanto's waste discharges. The major efforts made by Monsanto in waste treatment and disposal since 1969 are summarized below:

- Modifications in the waste collection system to divert nitrogenous and carbonaceous material to injection wells.
- Replacement of 20 barometric condensers by surface condensing units to reduce carbon and nitrogen discharges.
- Replacement of original major outfall to prevent recycling of PCB in outfall sediment and elimination of PCB from plant use.
- Installation of a skimming device on the new outfall to reduce oil and grease discharges.
- Installation of a pond for neutralization of water plant regeneration wastes.

- Conversion of one process waste holding pond for use as a secondary treatment lagoon for sanitary wastes.

PLANNED WASTE ABATEMENT

The following changes to reduce nitrogen, phosphorus and carbon in wastewater discharges into the Escambia River are projected for the immediate future (1972):

- Replacement of 4 additional barometric condensers with surface condensing units (removal of approximately 4,000 gpm).
- Changes in the process waste collection system to divert additional waste streams to deep well disposal -- although the ultimate capacity of this system is rapidly being approached.
- Secondary treatment pond with chlorination for sanitary wastes will be completed by December 31, 1972.
- Additional curbing and diking of storage and process areas to contain spills.

The following studies to reduce pollutants in waste streams discharged into the Escambia River are currently ongoing or will be initiated by Monsanto in the near future:

- Abolish the use of river water for cooling process vessels, thus eliminating the addition of pollutants through leaks and spills.
- Eliminate phosphorus in water treatment processes.
- Reuse and recycle additional waste streams.

- Redesign equipment to minimize discharges of pollutants.
- Survey point waste sources for further elimination (related to changes in collection system).
- Investigate heated discharges for possible elimination.

Monsanto is currently investigating the following treatment methods to complement or possibly replace deep well disposal for concentrated process waste streams:

- Submerged combustion
- Incineration
- Carbon adsorption
- Reverse osmosis
- Ion exchange
- Recycling and recovery

Conventional treatment is also being studied for use on certain waste streams or combinations of waste streams where the processes outlined above would not be feasible.

BASE WASTE LOADS

The base waste load data (Table I) show the present Monsanto waste loads generated within the plant and the fate of this waste including:

- Amount of waste reused or recycled within the plant
- Amount of waste pumped to deep well disposal
- Amount of waste discharged into the Escambia River.

These data were supplied by Monsanto and were derived from long-term average results.

TABLE I

BASE WASTE LOAD DATA

MONSANTO CHEMICAL COMPANY
MARCH, 1972

Parameter	Waste Load Generated lbs/day	Reused, Recovered or Recycled lbs/day	Reused, Recovered or Recycled Percent of Total	Deep Well Disposal lbs/day	Deep Well Disposal Percent of Total	Discharged to Escambia River lbs/day	Discharged to Escambia River Percent of Total
Total Organic Carbon	306,000	110,000	36	194,000	63.4	2,000	0.6
Total Nitrogen	120,000	93,400	78	26,000	21.5	600	0.5
Total Phosphorus	4,000	3,600	90	350	8.8	50	1.2

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WASTE SOURCE STUDY RESULTS AND DISCUSSION

STUDY METHODS

Samples were collected and waste discharges were determined (or supplied by Monsanto) at twenty-six locations, including inplant waste streams as shown on Figure 4. The exact location of sampling sites, type of sample collected, equipment and flow measuring technique used at each station are outlined in Appendix B.

All samples were analyzed for the following parameters: temperature (field); pH (field and laboratory); alkalinity and/or acidity; biochemical oxygen demand (BOD_5); chemical oxygen demand (COD); total organic carbon (TOC); total suspended and dissolved residue; total phosphorus; and total kjeldahl, ammonia and nitrite-nitrate nitrogen. Samples collected from raw water supplies (stations M-0 and M-1), deep well disposal (station M-2) and outfall sampling locations (stations M-3 and M-6) were also analyzed for heavy metals, phenols, oil and grease and the volatile residue series. Oil and grease and volatile residue determinations were made on samples from station M-5.

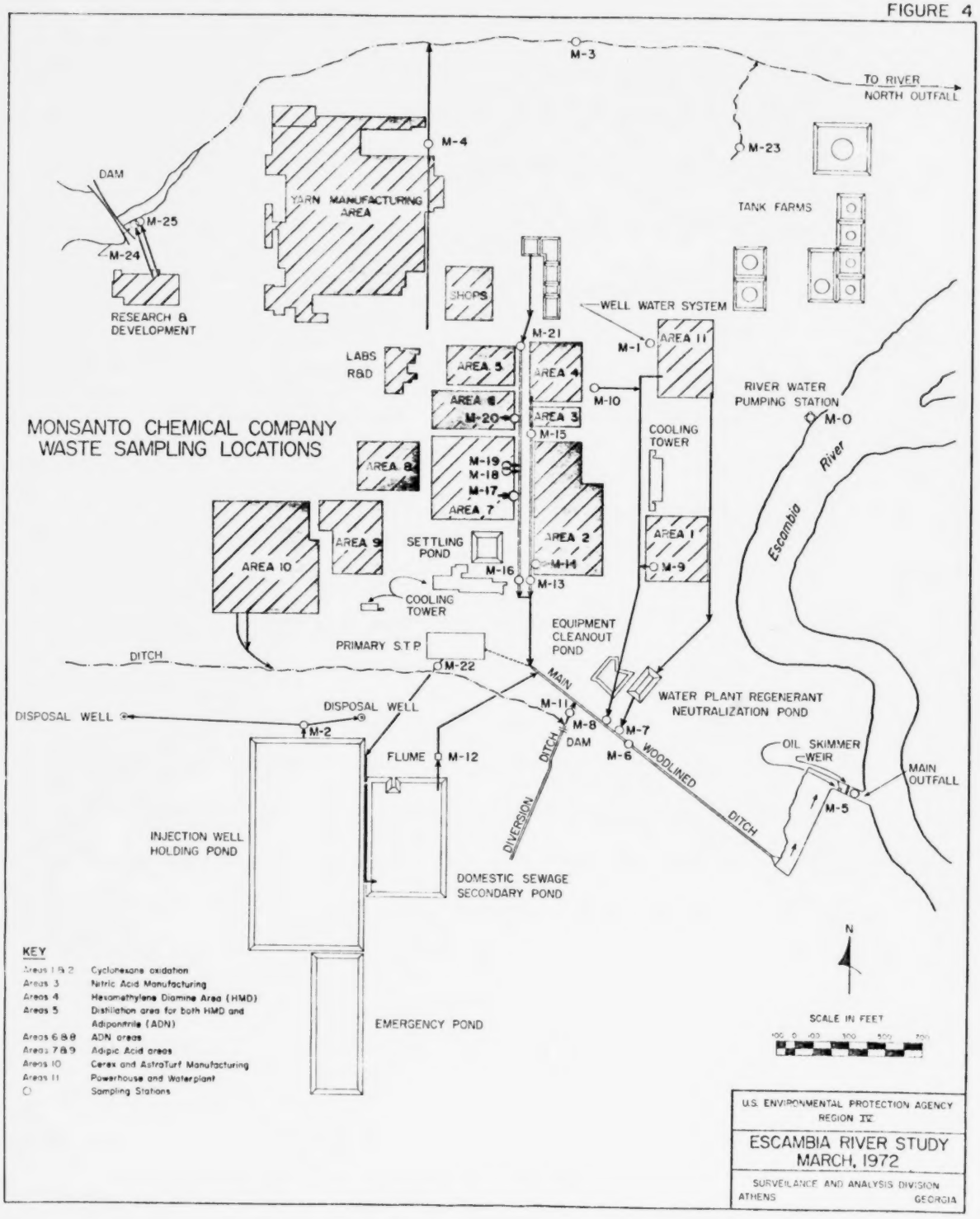
Daily samples from the raw water supplies, deep well disposal, and outfall locations were composited at each location for organic characterization and spark source mass-spectrophotometer analyses.

All chemical analytical methods are outlined in Appendices C and D. All analytical results -- excluding the organic characterization and metal scan analyses -- are presented in Appendix E.

CONTRIBUTING FACTORS

Monsanto production was normal and near capacity during the study.

FIGURE 4


MONSANTO CHEMICAL COMPANY
WASTE SAMPLING LOCATIONS
M-3
TO RIVER
NORTH OUTFALL
M-4
M-23
DAM
M-25
M-24
RESEARCH & DEVELOPMENT
YARN MANUFACTURING AREA
TANK FARMS
SHOPS
WELL WATER SYSTEM
M-21
M-1
AREA 11
LABS R&D
AREA 5
AREA 4
AREA 6
M-20
M-10
AREA 3
M-15
RIVER WATER PUMPING STATION
M-0
COOLING TOWER
AREA 8
M-19
M-18
M-17
AREA 7
Escambia River
AREA 10
AREA 9
SETTLING POND
AREA 2
AREA 1
M-16
M-14
M-9
M-13
COOLING TOWER
EQUIPMENT CLEANOUT POND
PRIMARY S.T.P.
DITCH
M-22
MAIN
WATER PLANT REGENERANT NEUTRALIZATION POND
DISPOSAL WELL
DISPOSAL WELL
M-11
M-8
M-7
M-2
DAM
M-6
OIL SKIMMER WEIR
FLUME
M-12
DITCH
WOODLINED
MAIN OUTFALL
M-5
DIVERSION
DITCH
INJECTION WELL HOLDING POND
DOMESTIC SEWAGE SECONDARY POND
EMERGENCY POND
KEY
Areas 1 & 2 Cyclohexane oxidation
Area 3 Nitric Acid Manufacturing
Area 4 Hexamethylene Diamine Area (HMD)
Area 5 Distillation area for both HMD and Adiponitrile (ADN)
Areas 6 & 8 ADN areas
Areas 7 & 9 Adipic Acid areas
Area 10 Corex and AstraTurf Manufacturing
Area 11 Powerhouse and Waterplant
Sampling Stations
N
SCALE IN FEET
100 0 100 200 300 400
U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV
ESCAMBIA RIVER STUDY
MARCH, 1972
SURVEILANCE AND ANALYSIS DIVISION
ATHENS GEORGIA

Company officials[1/] stated that no special or unusual measures were taken by Monsanto to withhold or reroute waste streams during the study. There were no major malfunctions or process upsets during the period of sampling. However, the following two minor problems did occur at the plant which did affect waste sampling:

- The transfer pump used to transport primary treated sewage to the secondary treatment pond was out of service during most of the study (it was in service during sampling of the secondary pond) which resulted in non-representative samples (station M-22) from the secondary sewage treatment pond, and
- A leak involving a cooling tower produced unusually high nitrogen (according to company officials) in one of the waste streams (station M-11).

Heavy rainfall occurred on the morning of March 8 and did affect the samples collected. The majority of the rain fell between 6:00 AM and 6:30 AM with light drizzle persisting until approximately 10:00 AM. Total rainfall on March 8 was 0.58 inches and was the only rain experienced during the study.[2/] This rainfall disrupted flow measurements at the yarn plant (station M-4) and the north outfall (station M-3) sampling stations. Because of the vast amount of roof area and pavement at the Monsanto facility, runoff was "flashy" and did not significantly affect the majority of samples collected. The samples most seriously affected by the rainfall would have been the grab samples (particularly

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1/ Personal Communication, J. J. Vick, Monsanto with M. D. Lair, EPA, 4/19/71, Pensacola, Florida.

2/ Data obtained via Telecon for Pensacola Airport from National Weather Service, NOAA, Lakeland, Florida, 3/19/72, by C. H. Sweatt.

the sample collected at station M-11), and the composite samples collected at the yarn plant (station M-4) and the North outfall (station M-3).

WASTE SAMPLING RESULTS AND DISCUSSION

Effluent Discharged into the Escambia River

The South or main and North outfalls comprise Monsanto's total liquid waste discharge into the Escambia River. Average survey concentrations and waste loads for these outfalls are presented in Table II.

The net waste loads[1/] of 1160 lbs/day of BOD_5, 688 lbs/day of total nitrogen and 60 lbs/day of total phosphorus exceeded the daily effluent limits established by the Federal-State conferees of 605 lbs/day, 248 lbs/day and 46 lbs/day, respectively. These nitrogen and phosphorus waste loads are slightly higher than reported by Monsanto in their base waste load data (600 lbs/day and 50 lbs/day, respectively). The net TOC base load (850 lbs/day) is substantially less than Monsanto's base load figure of 2000 lbs/day. Although Monsanto's base load data represent long-term averages, there was good agreement with study results for total nitrogen and phosphorus discharges.

A comparison of influent concentrations of Monsanto raw water supplies with effluent waste concentrations is presented in Table II. It should be noted that the BOD5, TOC, COD, nitrogen, and phosphorus concentrations -- although substantially higher than that found in Escambia River water during the survey -- are still at a rather low level. The total Monsanto effluent is relatively low in suspended solids (18 and 19 mg/l in the main and north outfalls, respectively) with a net discharged load of only 1330 lbs/day.

1/ The net waste loads were calculated by substracting waste loads contained in Monsanto's Escambia River raw water supply from the gross effluent waste loads.

TABLE II

AVERAGE INFLUENT AND EFFLUENT DATA
**** MONSANTO CHEMICAL COMPANY ****

MARCH, 1972

STATION	LOCATION	FLOW GPM	TEMP C	PH SU	BOD 5-DAY MG/L	T-ORG-C C MG/L	COD HI-LEV MG/L	PHOS-T P-WET MG/L	T-KJEL N MG/L	NH3-N T MG/L	NO2-NO3 N MG/L	RESIDUE T-NFLT MG/L	RESIDUE TOTAL MG/L
M-00	INF. ESCAMBIA RIVER WATER *	21200	14.5	6.6	1.4	7.4	34	0.05	0.34	0.14	0.1	14	79
M-01	INF. WELL WATER *	7130	21.0	5.4	1.0C	--	13	0.02	0.15	0.01	0.1	7C	47
M-06	MAIN OR SOUTH OUTFALL (001)	22600	27.0	7.1	5.1	10.0	38	0.26	1.55	0.79	1.3	18	169
M-03	NORTH OUTFALL (002)	685	36.6	6.4	31.0	7.0	29	0.27	1.13	0.59	0.2	19	56
M-23	TRIB. DITCH TO NO. OUTFALL *	95	31.5	6.7	10.4	9.0	31	0.14	0.87	0.45	0.4	9	72

STATION	LOCATION	PHENOLS MG/L	OIL & GREASE MG/L	CHROMUM T MG/L	ZINC T MG/L
M-00	INF. ESCAMBIA RIVER WATER	6	1.4	< 0.05	< 0.01
M-01	INF. WELL WATER	5C	4.8	< 0.05	< 0.01
M-06	MAIN OR SOUTH OUTFALL (001)	9	0.8	0.20	0.08
M-03	NORTH OUTFALL (002)	-	--	0.50	0.54
M-23	TRIB. DITCH TO NO. OUTFALL	-	--	--	--

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STATION	LOCATION	BOD 5-DAY LB/D	COD HI-LEV LB/D	T-ORG-C C LB/D	PHOS-P P-WET LB/D	NITROGN TOTAL LB/D	RESIDUE TOTAL LB/D	RESIDUE T-NFLT LB/D	OIL & GREASE LB/D	PHENOLS LB/D	CHROMUM T LB/D	ZINC T LB/D
M-06	MAIN OR SOUTH OUTFALL (001)	1430	10300	2680	71.0	765.0	46100	4820	206.0	2.4	54.2	21.7
M-03	NORTH OUTFALL (002)	108	140	30	2.2	10.7	382	50	13.4	0.2	4.1	4.4
M-23	TRIB. DITCH TO NO. OUTFALL	12	35	10	0.2	1.5	83	10	--	--	--	--
GROSS EFFLUENT WASTE LOAD (A)		1550	10500	2720	73.0	777.2	46560	4880	219.4	2.6	58.3	26.1
NET EFFLUENT WASTE LOAD (B)		1160	1840	850	60.0	668.0	26500	1330	--	1.1	58.3	26.1

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* DAILY GRAB SAMPLES
A INCLUDES THE INFLUENT WASTE LOAD IN MONSANTO'S RAW WATER SUPPLY.
B EXCLUDES THE INFLUENT WASTE LOAD IN MONSANTO'S RAW WATER SUPPLY.
C ONLY ONE VALUE

Substantial amounts of total chromium (63 lbs/day) -- 59 lbs/day in the main effluent -- and significant quantities of zinc (26 lbs/day) -- 22 lbs/day in the main effluent -- were discharged during the study. Spark-source mass-spectrophotometer scans of both outfalls were made for presence of metals. In addition to chromium and zinc, the scan revealed the presence of bromide, copper, and nickel in the main outfall in concentrations higher than those found in the River water. Copper was detected in the north outfall at concentrations higher than that found in the river water.

A gas chromatographic-mass spectrographic organic scan of the main effluent detected 0.74 mg/l of isooctylphthlate and several other phthlates at concentrations approximately 20 times lower than the isooctylphthlate. A polychlorinated biphenol compound, arochlor 1254 , was detected in the main outfall at a concentration of 0.2 µg/l. Isooctylphthlate was also detected in the north outfall at 0.80 mg/l and several other phthlates were detected at much lower concentrations. Neither adipic acid nor adiponitrile (basic nylon intermediates) were detected in either of Monsanto's outfalls indicating that the separation of concentrated process wastes and dilute process wastes and cooling waters is rather complete. A small quantity of phenols (1.1 lbs/day) were discharged.

The pH of wastes in the main outfall varied considerably from basic (pH 9.5) to acidic (pH 3.6). This extreme pH fluctuation reflected inadequate pH control on the discharge from the water treatment regeneration pond (station M-7).

The average main and north outfall temperatures were elevated 12.8°C (23°F) and 22.1°C (39.8°F), respectively, above the influent Escambia

River water temperature during the study.

Because of low waste concentrations of nitrogen, phosphorus and carbon and the high volumes of wastewater (23,400 gpm or 33.7 MGD) it does not appear that conventional waste treatment techniques would be feasible for the combined discharge of both outfalls -- or either outfall alone. Waste treatment or disposal alternatives for the main and north outfall waste discharges appear to be limited to:

- Additional in-plant waste reductions for point source waste discharges, process modification and waste collection system improvements.
- Additional in-plant pH controls.
- A closed loop cooling system for the entire cooling water discharge or a series of closed loop cooling systems for chemical process areas, with the resultant cooling tower blowdown discharged to deep well disposal.

Wastes Discharged to Deep Well Disposal

Numerous process waste streams are discharged into a holding basin for subsurface disposal. For the purposes of this study these wastes were characterized by collecting a daily grab sample from the deep well pump header. The average analytical data and waste loads for these wastes are presented in Table III. The data indicate that the bulk of pollutants are disposed of through the well system.

The waste loads disposed of by Monsanto through this system during the study are compared with Monsanto's base load data in the following summary:

TABLE III

AVERAGE DEEP WELL DISPOSAL WASTE DATA

MONSANTO CHEMICAL COMPANY
March, 1972

Parameter	Concentration (mg/1 or as Noted)	Waste Load (lbs/day)
Flow (GPM)	2460.00	--
pH (Field)	2.60	--
Temperature (C)	23.00	--
BOD (5-day)	14800.00	442000
COD	19700.00	583000
TOC	5357.00	159000
Phosphorus-P (Total)	10.90	324
Residue (Total)	10000.00	296000
Residue (Vol-Total)	6930.00	214000
Residue (NFLT)	19.00	562
Residue (Vol NFLT)	16.00	483
TKN-N	737.00	21800
Ammonia-N	429.00	12500
Nitrite-Nitrate-N	1160.00	34200
Oil & Grease	279.00	8200
Phenols	6.50	194
Chromium (Total)	0.60	18
Cobalt	1.30	38
Copper	5.10	150
Manganese	0.08	2
Vanadium	4.00	118
Zinc	0.30	9

	Waste Loads to Deep Well Disposal (lbs/day	
	EPA Study	Monsanto Base Loads
Total Organic Carbon	159,000	194,000
Total Nitrogen	56,000	26,000
Total Phosphorus	324	350

It should be noted that Monsanto's base loads are based on long term average data. However, the total nitrogen pumped to deep well disposal was substantially higher during this study than Monsanto's indicated base load.

Although the total residue load was quite high (296,000 lbs/day), the quantities of nonfilterable residue pumped to subsurface disposal were minimal (562 lbs/day). The waste is highly acidic (pH 2.6) with a total acidity of 7460 mg/l (as $CaCO_3$).

The following organic compounds were detected in the waste by gas-chromatographic and mass-spectrographic analysis:

Compound	Concentration (mg/l)
Valeric Acid	500
Cyclohexanol	100
Caproic Acid	220
Adiponitrile	320
Adipic Acid	3.7

In addition to the compounds listed above, there were 50-75 other compounds detected in the analyses. These additional compounds appeared to be primarily higher molecular weight alcohols and ketones with an estimated concentration range of 0.050-5.0 mg/l. The waste had a characteristic strong odor which was attributed to the high concentrations

of Valeric and Caproic Acids. In addition to these specific organic compounds, 194 lbs/day of phenols and 8200 lbs/day of oil and grease were pumped to subsurface disposal.

The most significant metals and quantities pumped to subsurface disposal were: total chromium (18 lbs/day), copper (150 lbs/day) and Vanadium (118 lbs/day). In addition to the metals listed in Table III, a semi-quantitative spark-source mass-spectrophotometer scan revealed that nickel, iron and aluminum were present in the waste in concentrations exceeding 100 µg/l.

The Florida Pollution Control Board has directed Monsanto to provide secondary treatment to all wastes disposed of through the deep well disposal system by January 1, 1973. Because of the concentrated nature of the wastes, it would be necessary to substantially dilute the total waste stream to make it amenable to conventional biological waste treatment techniques. The limited additional capacity of the present well system and the additional number of disposal wells required seem to preclude this type of treatment. Treatment of individual waste streams (treatment of wastes at the source) prior to deep well disposal, appears to provide the most satisfactory abatement alternative.

In-plant Waste Streams

Twenty-three in-plant waste streams were sampled at Monsanto in order to determine their amenability to conventional waste treatment techniques. In general, these waste streams consisted of cooling water discharges, condenser effluent, pump-seal water, process spills and other dilute waste streams. These streams ultimately discharge into the Escambia

River and are not to be confused with the concentrated process waste streams which are collected in a separate system and disposed of through deep wells. The average in-plant waste stream concentrations, and waste loads, for the period of study, are presented in Table IV.

Four in-plant waste streams discharge into the north outfall. Two research building drains -- designated as stations M-24 and M-25 -- contained insignificant quantities of pollutants. The discharge from the yarn plant (staton M-4) contained significant amounts of BOD_5 (16 mg/1), total phosphorus (0.75 mg/1) and nitrogen (TKN - 0.64 mg/1 and NH_3 - 0.24 mg/1). However, because of the relatively low volume (356 gpm), waste loads of these materials were not excessively high. The yarn plant discharge was extremely hot (46.4°C) and had a significant influence on the temperature of the water discharged from north Outfall. The sum of waste loads and flows upstream, of sampling station M-3 were significantly lower from those obtained at station M-3, indicating that an unsampled waste stream, surface runoff, or subsurface drainage enters the outfall ditch upstream of station M-3. A dump contiguous to the outfall ditch may be contributing wastes to it. The waste stream sampled at station M-23 was discussed under the section "Effluent Discharged into the Escambia River." None of the north outfall contributory waste streams contained pollutants in concentrations high enough for conventional waste treatment methods.

The remaining waste streams to be discussed drain into the main outfall primarily through three major collection systems, the east and west wood-lined ditches and a 48 inch sewer.

The east wood-lined ditch contains discharges from the cyclohexane oxidation, nitric acid manufacturing, and hexamethylene diamine areas.

AVERAGE INPLANT WASTE STREAM ANALYTICAL DATA
**** MONSANTO CHEMICAL COMPANY ****

MARCH, 1972

STATION	FLOW GPM	PH SU	T-ALK CACO3 MG/L	ACIDITY CACO3 MG/L	TEMP C	BOD 5-DAY MG/L	COD HI-LEV MG/L	T-ORG-C C MG/L	PHOS-T P-WET MG/L	T-KJEL N MG/L	NH3-N T MG/L	NO2-NO3 N MG/L	RESIDUE TOTAL MG/L	RESIDUE T-NFLT MG/L
M-04	356	6.6	9	6	46.4	16	28	6	0.75	0.64	0.24	0.2	60	8
M-07	188	8.8	862	868	21.1	2	16	19	0.12	0.38	0.10	7.8	3471	17
M-08	7977	7.1	13	5	27.8	5	32	9	0.09	0.74	0.33	0.4	131	14
M-09	94	4.2	3	224	30.8	66	1574	550	1.29	92.83	21.32	321.4	543	14
M-10	1042	6.9	11	4	27.5	2	26	9	0.06	0.39	0.16	0.1	94	11
M-11	549	6.5	75	25	19.0	12	65	18	2.61	23.86	18.31	27.3	1890	23
M-12	390	6.7	11	7	16.0	26	119	23	1.84	5.35	2.10	0.3	148	28
M-13	3497	6.7	11	9	29.1	13	35	11	0.07	0.97	0.49	0.7	79	11
M-14	51	6.2	9	13	24.1	34	82	19	0.10	0.78	0.38	1.3	91	18
M-15	2836	7.1	12	4	29.9	26	34	9	0.11	0.83	0.36	0.3	83	16
M-16	4681	6.4	8	4	22.5	13	29	9	0.11	0.71	0.14	0.7	77	11
M-17	800	5.7	4	6	32.1	2	25	8	0.04	0.55	0.13	11.6	78	10
M-18	1841	6.5	10	4	21.2	4	27	9	0.05	0.36	0.08	0.1	69	12
M-19	1950	6.5	9	5	20.1	3	28	9	0.05	0.29	0.06	0.2	69	13
M-20	81	7.2	12	6	59.0	24	104	34	0.45	9.23	1.40	0.6	26	11
M-21	12	6.8	6	5	22.5	< 1	8	< 1	0.01	0.21	0.17	0.2	43	--
M-22	--	7.1	30	16	24.5	110	265	37	4.13	9.90	4.05	0.2	182	78
M-24	28	6.5	7	4	21.5	< 1	1	< 1	0.02	0.14	0.03	0.1	41	--
M-25	144	6.5	6	4	32.3	< 1	24	< 1	0.03	0.12	0.00	0.1	40	--

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AVERAGE INPLANT WASTE STREAM LOADS

STATION	FLOW GPM	BOD 5-DAY LB/D	COD HI-LEV LB/D	T-ORG-C C LB/D	PHOS-T P-WET LB/D	T-KJEL N LB/D	NH3-N T LB/D	NO2-NO3 N LB/D	RESIDUE TOTAL LB/D	RESIDUE T-NFLT LB/D
M-04	356	66.7	119	27	3.30	2.75	1.01	1.1	258	36
M-07	188	3.6	41	29	0.28	0.81	0.27	14.1	7154	41
M-08	7977	430.1	2992	844	8.43	70.73	32.38	43.0	12450	1375
M-09	94	158.8	3322	1378	1.43	13.61	6.11	135.0	851	17
M-10	1042	27.0	329	108	0.76	4.88	1.97	1.3	1195	129
M-11	549	96.4	381	111	16.03	118.54	91.19	146.0	8159	227
M-12	390	121.8	558	108	8.62	25.10	9.80	1.6	694	131
M-13	3497	519.9	1483	443	2.88	40.58	20.34	27.8	3318	443
M-14	51	18.9	48	10	0.04	0.19	0.02	0.1	52	11
M-15	2836	101.3	1189	306	3.82	29.02	12.59	7.2	2924	543
M-16	4681	750.7	1638	516	6.32	40.85	8.40	39.3	4350	617
M-17	800	19.9	238	73	0.43	5.31	1.25	111.1	746	100
M-18	1841	85.9	591	190	1.01	7.99	1.77	3.2	1515	251
M-19	1950	75.1	659	208	1.24	6.78	1.42	4.2	1614	301
M-20	81	26.6	42	10	0.17	1.20	0.43	0.5	21	8
M-24	28	--	0	--	0.01	0.05	0.01	0.1	14	--
M-25	144	--	7	--	0.07	0.22	0.01	0.2	60	--

The ditch was sampled at two locations, station M-13 (downstream location) and station M-15 (upstream location). The total flow (3497 gpm) in the ditch at station M-13 contained significant loads of BOD_5 (520 lbs/day), COD (1480 lbs/day), and total nitrogen (89 lbs/day). Although a significant amount of pollutants was added between sampling stations, the majority of the flow (2836 gpm) and pollutants originated above sampling station M-15 and were discharged from the hexamethylene diamine area. A small discharge of 51 gpm from the cyclohexane oxidation area was also sampled (station M-14). This discharge, which enters the east wood-lined ditch above station M-13, contained high concentrations of BOD_5 (34 mg/1), COD (82 mg/1) and nitrogen (0.78 mg/1 - TKN, 0.38 mg/1 - NH_3, 1.3 mg/1 - NO_2-NO_3). Because of the small waste volume, it did not materially contribute to the waste load in the east ditch. Concentrations of pollutants in the east wood-lined ditch are too low for conventional waste treatment.

The west wood-lined ditch receives storm drainage and discharges from the Hexamethylene Diamine (HMD) area, the HMD and adiponitrile (ADN) distillation areas and adipic acid areas. The west ditch (station M-16) contained significant waste loads of BOD_5 (751 lbs/day), COD (1638 lbs/day), TOC (516 lbs/day), and total nitrogen (89 lbs/day). The high BOD_5 load was due primarily to a single high value (30 mg/1) which occurred on the first day of the survey. The average of the other two usable BOD_5 values obtained during the survey was 4.1 mg/1 which would have produced a BOD_5 load of approximately 240 lbs/day.

Five waste discharges into the West wood-lined ditch were sampled during the study. A waste stream from the adipic acid area (station M-17) contributed a substantial amount of total nitrogen, particularly nitrite-nitrate nitrogen (111 lbs/day) to the wood-lined ditch. Two barometric

condenser discharges from the adipic acid area (sampled at stations M-18 and M-19) contributed significant amounts of organic carbon (398 lbs/day) to the ditch. These barometric condenser discharges will be eliminated during the summer of 1972 by replacing four barometric condensers with surface units. A discharge from a steam squelcher in the adiponitrile area (sampled at station M-20) was extremely hot (59°) and contained nitrogen and phosphorus (Total P -- 0.45 mg/1, TKN -- 9.23 mg/1, NH_3 -- 1.40 mg/1, NO_2-NO_3 -- 0.6 mg/1). Because of the small volume (81 gpm), the contribution of this waste stream was insignificant. A discharge from a desuperheating station in the hexamethylene diamine and adiponitrile distillation areas (sampled at station M-21) was of such small volume (12 gpm) that it was insignificant. As was the case with most of the dilute Monsanto discharges, pollutant concentrations in the west woodlined ditch were simply not high enough for conventional waste treatment techniques.

As previously discussed, the Monsanto sewage system was not fully operational during the study and primary treated sanitary sewage was discharged into the main outfall during 6 of the 7 days of sampling. The data for the primary sewage (sampling station M-22) effluent and the secondary pond (sampling station M-12) effluent are presented without discussion in Table IV. Monsanto will provide a minimum of secondary treatment (90% BOD_5 removal) for sanitary wastes by the end of 1972.

Discharges from the Cerex and Astroturf Manufacturing areas and storm drainage are shown in data from station M-11. The ditch containing these discharges drains a substantial area of the plant and surrounding land. This was illustrated by comparing the flow on the morning of March 8 (2060 gpm) after a 0.58 inch rainfall with flow when there was

no rain (251-350 gpm). The study revealed substantial amounts of total phosphorus (2.61 mg/1) and nitrogen (TKN -- 23.9 mg/1, ammonia -- 18.3 mg/1 and nitrite-nitrate -- 27.3 mg/1). These high concentrations were attributed to an ammonia leak into a cooling tower during the study. However, the high phosphorus (16 lbs/day) and total nitrogen (355 lbs/day) loads discharged make this stream a prime candidate for further study by Monsanto. Individual discharges might be eliminated or modified to reduce total phosphorus and nitrogen.

The 48" sewer discharging into the main outfall receives discharges from the Cyclohexane oxidation areas, the powerhouse and the HMD areas. In addition to the total discharge of this stream (station M-8), two contributory waste streams were sampled; a waste stream from the HMD area (station M-10) and one from the cyclohexane oxidation area (station M-9).

The waste stream from the HMD area (station M-10) did contain some ammonia nitrogen but was low in other pollutants and was not particularly significant.

The waste stream from the cyclohexane oxidation area (station M-9) was the most concentrated stream sampled during the study. This sampling station was originally scheduled to be sampled on a continuous 24 hour composite basis; however, when certain cleaning operations are underway in the cyclohexane oxidation area this stream is diverted to deep well disposal. After the third day of the survey, this condition became apparent and sampling was continued on a grab basis. This stream was diverted to deep well disposal as follows:

March 8	4 hours
March 9	10 hours

March 10	10 hours
March 11	14½ hours
March 12	0 hours
March 13	0 hours

During the study, it was noted that when wastes were diverted to deep well disposal the diversion gate leaked an estimated 30-40% of the total waste flow into the main outfall. Because of the location of the weir and stage recorder, it was not possible to measure flow when the wastes were diverted. The flow indicated in Table IV is an average value for undiverted flow. No grab samples were collected when the wastes were diverted. Since the flows in Table IV are inaccurate due to flow diversion, the waste loads in Table IV should be regarded as estimates. However, even with the low waste volume (94 gpm), the concentrations of BOD_5, COD, TOC, total phosphorus and nitrogen were high enough to represent a significant waste load. This stream definitely should be subjected to some form of waste control or treatment.

The total discharge of the 48" sewer (7977 gpm) was the largest contributing stream to the main outfall. However, the average BOD_5 (5 mg/1), COD (32 mg/1) and TOC (9 mg/1) concentrations were only slightly higher than the raw Escambia River intake concentrations. The great bulk of the water in this stream is once-through cooling water from the powerhouse and would be expected to have essentially the same concentrations of all waste parameters as the river water.

The water plant regeneration wastes are discharged into a small holding pond in an attempt to neutralize the wastes from caustic and

acidic regeneration cycles before discharge into the river outfall. The holding pond was not operating satisfactorily and wastes discharged from the pond (station M-7) were alternately highly acidic and caustic. These wastes significantly affected the pH of the main outfall wastes and it is apparent that Monsanto will have to implement a satisfactory pH control system for this discharge.

The concentrations of pollutants in all in-plant waste streams comprising the discharge into the Escambia River show that these streams are too dilute for conventional waste treatment methods (Table IV). The only apparent waste reduction method available to Monsanto is control or elimination of waste discharges at the source.

REFERENCES

1. Effects of Pollution on Water Quality, Escambia River and Bay, Florida, USDI, FWPCA, Southeast Water Laboratory, Athens, Georgia, January 1970.

2. Proceedings of the Conference in the Matter of Pollution of Interstate Waters of the Escambia River Basin (Alabama-Florida) and the Intrastate Portions of the Escambia Basin Within the State of Florida, USDI, FWPCA, Gulfbreeze, Florida, January 21-22, 1970.

3. Proceedings of the Second Session of the Conference in the Matter of Pollution of the Interstate Waters of the Escambia River Basin (Alabama-Florida) and the Intrastate Portions of the Escambia Basin Within the State of Florida, EPA, Pensacola, Florida, February 23-24, 1971.

4. Preliminary Conclusions and Recommendations of the Third Session of the Conference in the Matter of Pollution of the Interstate Waters of the Escambia River Basin (Alabama-Florida) and the Intrastate Portions of the Escambia Basin Within the State of Florida, EPA, Pensacola, Florida, January 24-25, 1972.

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7. Dean, B. T., "The Design and Operation of a Deep-Well Disposal System," Journal Water Pollution Control Federation, Vol. 37, No. 2, February 1965.

8. Batz, M. E., "Deep Well Disposal of Nylon Waste Water," Chemical Engineering Progress, October 1964.

9. Goolsby, Donald A., "Hydrogeochemical Effects of Injecting Wastes Into a Limestone Aquifer Near Pensacola, Florida," Journal National Well Association, Vol. 1, Jan.-Feb. 1971.

10. Goolsby, Donald A., "Geochemical Effects and Movement of Injected Industrial Waste in a Limestone Aquifer," Presented at the Joint American Association of Petroleum Geologists, United States Geological Survey Symposium on "Underground Waste Management and Environmental Implication," Houston, Texas, December 6-9, 1971.

APPENDICIES

APPENDIX A

MONSANTO STUDY
PROJECT PERSONNEL

M. D. Lair, Project Engineer, EPA, Surveillance and Analysis Division

T. B. Bennett, Project Chemist, EPA, Surveillance and Analysis Division

R. P. Lawless, Chemist, EPA, Surveillance and Analysis Division

R. Wilkerson, Hydraulic Engineering Technician, EPA, Surveillance and Analysis Division

E. Shollenberger, Engineering Technician, EPA, Surveillance and Analysis Division

W. Johnson, Chemical Technician, EPA, Surveillance and Analysis Division

J. Williams, Engineering Technician, Florida Department of Pollution Control

APPENDIX B
MONSANTO CHEMICAL COMPANY SAMPLING LOCATIONS

EPA Sta. No.	Sample Location and Description	Sample Type	Sampler Type	Waste Flow
M-0	Raw Escambia Riv Water Supply at Pumping Station	Grab	Manual	Monsanto Measurement Average Daily
M-1	Raw Well Water Supply at Power-house	Grab	Manual	Monsanto Measurement Average Daily
M-2	Holding Pond Effluent to Deep Well Disposal From Pump Header	Grab	Manual	Monsanto Measurement Average Daily
M-3	Total 002 (North Outfall) Including RD1, RD2, Y1 Outfalls at Co. Sampling Station	24-Hour Composite	Monsanto Sampler	EPA Measurement Average Daily
M-4	Yarn Plant Discharge (Y1) at Co. Sampling Station	24-Hour Composite	Monsanto Sampler	EPA Measurement* Average Daily
M-5	Total 001 (Main or South Outfall) at Final Weir	Grab	Manual	Measured Upstream (M6)
M-6	Total 001 (Main or South Outfall) at Co. Sampling Station Above Outfall Works	24-Hour Composite	Monsanto Sampler	Monsanto Measurement Average Daily
M-7	Water Plant Regeneration Pond Discharge at WP-1 Outfall Pipe	Grab	Manual	Monsanto Measurement Average Daily
M-8	Discharge From Manufacturing Plants 1, 4, and 11 at D5 Outfall Pipe	24-Hour Composite	Monsanto Sampler	Monsanto Measurement Average Daily
M-9	Manufacturing Area 1 Discharge at D4 Outfall Pipe	24-Hour Composite	Monsanto Sampler & Manual	EPA Measurement Average Daily
M-10	Manufacturing Area 4 Discharge at D2 Outfall Pipe	24-Hour Composite	EPA Sampler	Monsanto Measurement Average Daily

* Monsanto weir or flume used in measurement.

APPENDIX B (CONTD)

EPA Sta. No.	Sample Location and Description	Sample Type	Sampler Type	Waste Flow
M-11	Storm Water & Cond. From Mfg. Areas 8, 9 and 10 (A1) Plus Limestone Neutralization of HCL (A2) at A3 Outfall	Grab	Manual	EPA Measurement Instantaneous
M-12	Discharge From Secondary Sewage Pond (S2) at Parshall flume	24-Hour Composite	EPA Sampler	EPA Measurement* Average Daily
M-13	East Wood-Lined Ditch (EWD), Tot. Discharge at Co. Sampling Sta.	24-Hour Composite	Monsanto Sampler	EPA Measurement Average Daily
M-14	Condensate and Pump Seal Flush to EWD at 18" E39 Outfall	Grab	Manual	EPA Measurement Instantaneous
M-15	Discharge From Mfg. Areas 4 & 5 (E3, E5 and E7 Outfalls), to EWD at Co. Sampling Sta.	24-Hour Composite	EPA Sample	EPA Measurement* Average Daily
M-16	West Wood-Lined Ditch (WWD) Total Discharge at Co. Sampling Sta.	24-Hour Composite	Monsanto Sampler	Monsanto and EPA Measurement, Avg. Daily
M-17	Steam Condensate to WWD at 18" W66 Outfall	Grab	Manual	Monsanto Records Average Daily
M-18	Barometric Condenser Leg at 42" W53 Outfall to WWD at Co. Sampling Station	24-Hour Composite	EPA Sampler	Monsanto Measurement Average Daily
M-19	Barometric Condenser Leg at 36" W53 Outfall to WWD at Co. Sampling Station	24-Hour Composite	Monsanto Sampler	Monsanto Measurement Average Daily
M-20	Steam Squelcher + Surface Drainage at 30" W43 Outfall to WWD	24-Hour Composite	EPA Sampler	EPA Measurement* Average Daily
M-21	Desuper Heating Station at 12" W2 Outfall to WWD	Grab	Manual	EPA Measurement Instantaneous

APPENDIX B (CONTD)

EPA Sta. No.	Sample Location and Description	Sample Type	Sampler Type	Waste Flow
M-22	Primary Sewage Effluent Before Chlorination	24-Hour Composite	EPA Sampler	None
M-23	Ditch Tributary to North Outfall	Grab	Manual	EPA Measurement Instantaneous
M-24	Research Building Drain	Grab	Manual	EPA Measurement Instantaneous
M-25	Research Building Drain	Grab	Manual	EPA Mesurement Instantaneous

APPENDIX C

CHEMICAL ANALYTICAL METHODS

Water and Wastewater

PARAMETER	METHOD	REFERENCE	MODIFICATION
Acidity	Volumetric, NaOH Titration	1	Potentiometric Endpoint
Alkalinity	" H_2SO_4 Titration	1	" "
Ammonia	Automated Phenolate Method	2	None
Biochemical Oxygen Demand	Winkler D.O., 5-day	1,2	Azide Modification Formula "C" Dilution Water w/Sewage Sed.
Chemical Oxygen Demand	Acid-Dichromate Oxidation	2	None
Chromium, Total	Atomic Absorption	1,2	HCl-HNO_3 Digestion
Cobalt	Atomic Absorption	1,2	HCl-HNO_3 Digestion
Copper	Atomic Absorption	1,2	HCl-HNO_3 Digestion
Dissolved Solids	Difference Between Total and Solids	-	-
Cyanides	Pyridine-Pyrazolone	1,2,4	Distillation Cleanup
Manganese	Atomic Absorption	1,2	HCl-HNO_3 Digestion
Nitrate-Nitrite	Copper-Cadmium Reduction, Automated	2	None
Oil and Grease	Solvent Extraction	1	None
pH	Electrometric	1	None

PARAMETER	METHOD	REFERENCE	MODIFICATION
Phenols	4-Aminoantipyrine	1	Distillation, Automated Colorimetric Analysis
Phosphorus	Ascorbic Acid Method	2	Automated, Manual Digestion
Suspended Solids	Gravimetric	1	None
Thiocyanates	Ferric Nitrate Complex	3	-
Total Kjeldahl Nitrogen	Automated Phenolate Method	2	None
Total Organic Carbon	Carbon Analyzer	2	None
Total Solids	Gravimetric, 105°C	1	None
Turbidity	Hellige Turbidimeter	2	None
Volatile Suspended Solids	Gravimetric, 550°C	1	None
Volatile Total Solids	Gravimetric, 550°C	1	None
Zinc	Atomic Absorption	1,2	$HCl-HNO_3$ Digestion
Titanium	Atomic Absorption	1,2	$HCl-HNO_3$ Digestion
Vanadium	Atomic Absorption	1,2	$HCl-HNO_3$ Digestion

References

1. Standard Methods for Examination of Water and Wastewater, 13th Edition, 1971.
2. EPA Manual of Methods for Chemical Analyses of Water and Wastes, 1971.
3. Colorimetric Methods of Analysis, Vol. 11A, 1959, Snell and Snell.
4. ASTM Book of Standards, Part 23, 1971.

APPENDIX D

ORGANIC ANALYTICAL METHODS

Samples from stations M-0, M-1, M-3, and M-6 were approximately neutral pH when received. They were extracted with 15 percent methylene chloride in hexane, made strongly basic with KOH and re-extracted with 15 percent methylene chloride in hexane, acidified with sulfuric acid and extracted for the third time with methylene chloride. The samples were dried by passing through glass wool and then concentrated to 1 ml in a Kuderna-Danish concentrator. The acid extract was esterified using diazomethane. All extracts were injected into a gas chromatograph equipped with a flame ionization detector. The column was glass 6' x 2.5 mm I.D. packed with 3 percent SE-30 on Chromosorb W, HP. The oven was programmed from 75° to 240° at 10°/min. An attempt was made to identify all peaks detected using the Finnigan GC/MS Model 1015 system. The compounds listed were confirmed by injecting a known standard into the GC/MS. Quantitation was done on the gas chromatograph.

Sample M-2 was acid when received so it was extracted first with methylene chloride then made basic and re-extracted with 15 percent methylene chloride.

The acid extract was divided in half after concentration. One portion was analyzed as is, the other portion was esterified. There were no other deviations.

All samples were extracted in duplicate and the concentrations found represent the average of the duplicates. Concentrations found should be considered minimum concentrations as the percent recovery of each compound from water is unknown.

E-1

APPENDIX E

WASTE SAMPLING DATA

STORET RETRIEVAL DATE 72/06/01

641000 M-00 F-033-61

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00058 FLOW RATE GPM	00400 PH SU	00410 T ALK CACO3 MG/L	00435 T ACDITY CACO3 MG/L	00010 WATER TEMP CENT	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00680 T ORG C C MG/L	00665 PHOS-T P-WET MG/L	00625 TOT KJEL N MG/L
72/03/08	08	45	19900.00	6.60	13	6	15.0	1.0	39	8.0	0.05	0.600
72/03/09	08	20	18800.00	6.90	10	5	14.0	8.0K	24	9.0	0.04	0.550
72/03/10	08	20	20200.00	6.40	8	8	13.0	1.0K	28	8.0	0.05	0.280
72/03/11	08	15	20300.00	6.70	10	7	14.0	1.0K	47	7.0	0.06	0.220
72/03/12	08	20	21900.00	6.50	9	4	14.0	1.0K	58	9.0	0.08	0.270
	09	15		6.60			14.0					
72/03/13	08	10	23500.00	6.60	11	4	16.0	1.4	23	6.0	0.04	0.200
72/03/14	08	20	23500.00	6.30	12	3	16.0	1.9	20	5.0	0.05	0.250

DATE FROM TO	TIME OF DAY	DEPTH FEET	00610 NH3-N TOTAL MG/L	00630 NO2&NO3 N MG/L	00500 RESIDUE TOTAL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	00515 RESIDUE DISS-105 C MG/L	00520 RESIDUE VOL FLT MG/L
72/03/08	08	45	0.400	0.1	78	11	5K	67	38
72/03/09	08	20	0.005	0.1	72	10	5K	62	21
72/03/10	08	20	0.005K	0.1	81	29	5	52	36
72/03/11	08	15	0.005K	0.1	79	17	5K	62	34
72/03/12	08	20	0.005	0.05	85	13	5K	72	36
72/03/13	08	10	0.005K	0.1	82	11	5K	71	43
72/03/14	08	20	0.005K	0.1	75	8	5K	67	41

STORET RETRIEVAL DATE 72/06/01

641002 M-01 F-033-62

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00058 FLOW RATE GPM	00400 PH SU	00410 T ALK CACO3 MG/L	00435 T ACDITY CACO3 MG/L	00010 WATER TEMP CENT	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00680 T ORG C C MG/L	00665 PHOS-T P-WET MG/L	00625 TOT KJEL N MG/L
72/03/08	08	30	7180.00	4.70	6	25	21.5	1.0	25	1.0K	0.01	0.100K
72/03/09	08	10	7120.00	5.40	5	12	20.0	1.0K	4	1.0K	0.01	0.100
72/03/10	08	10	7090.00	5.50	5	23	21.0	1.0K	4	1.0K	0.01	0.100K
72/03/11	08	05	6910.00	5.40	5	19	20.0	1.0K	27	1.0K	0.01K	0.100K
72/03/12	08	10	7190.00	5.80	5	25	21.0	1.0K	23	1.0K	0.02	0.200
72/03/13	08	05	7250.00	5.50	6	16	21.0	1.0K	6	1.0K	0.03	0.150
72/03/14	08	10	7150.00	5.40	7	15	22.0	1.0K	2	1.0K	0.02	0.100K

DATE FROM TO	TIME OF DAY	DEPTH FEET	00610 NH3-N TOTAL MG/L	00630 NO2&NO3 N MG/L	00500 RESIDUE TOTAL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	00515 RESIDUE DISS-105 C MG/L	00520 RESIDUE VOL FLT MG/L
72/03/08	08	30	0.005	0.1	51	5K	5K	51	10
72/03/09	08	10	0.005K	0.1	32	5K	5K	32	5K
72/03/10	08	10	0.005K	0.1	45	7	5K	38	8
72/03/11	08	05	0.005K	0.1	42	5K	5K	42	10
72/03/12	08	10	0.010	0.1	70	5K	5K	70	23
72/03/13	08	05	0.005	0.2	46	5K	5K	46	18
72/03/14	08	10	0.005K	0.1	46	5K	5K	46	5K

STORET RETRIEVAL DATE 72/06/01

641004 M-02 F-033-63

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00058 FLOW RATE GPM	00400 PH SU	00410 T ALK CACO3 MG/L	00435 T ACDITY CACO3 MG/L	00010 WATER TEMP CENT	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00680 T ORG C C MG/L	00665 PHOS-T P-WET MG/L	00625 TOT KJEL N MG/L
72/03/08	11	15	2600.00	2.80	0	7054	22.0	18000.0	20400	5800.0	9.30	740.000
72/03/09	08	35	1840.00	3.00	0	5450	19.0	11000.0	18300	5200.0	9.30	700.000
72/03/10	08	50	2260.00	2.70	0	7456	20.0	11500.0	19300	5200.0	14.40	720.000
72/03/11	08	35	2670.00	2.70	0	7650	31.0	11100.0	19300	5100.0	13.30	652.000
72/03/12	08	50	2670.00	2.50	0	7900	23.0	11000.0	19600	5100.0	12.40	788.000
72/03/13	08	45	2600.00	2.10	0	8300	21.0	28800.0	20400	5300.0	12.10	685.000
72/03/14	08	50	2570.00	2.50	0	8400	26.0	11900.0	20500	5800.0	5.70	875.000

DATE FROM TO	TIME OF DAY	DEPTH FEET	00610 NH3-N TOTAL MG/L	00630 NO2&NO3 N MG/L	00500 RESIDUE TOTAL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	00515 RESIDUE DISS-105 C MG/L	00520 RESIDUE VOL FLT MG/L
72/03/08	11	15	450.000	900.0	7243	23	23	7220	5837
72/03/09	08	35	550.000	1200.0	10800	10		10790	
72/03/10	08	50	450.000	1100.0	7550	21	12	7529	6168
72/03/11	08	35	550.000	1500.0	9440	16	5	9424	8085
72/03/12	08	50	300.000	1100.0	11500	17	5K	11480	9850
72/03/13	08	45	350.000	1050.0	11980	20	18	11960	1752
72/03/14	08	50	350.000	1250.0	11470	24	21	11450	9809

STORET RETRIEVAL DATE 72/06/01

641006 M-03 F-033-64

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00058 FLOW RATE GPM	00400 PH SU	00410 T ALK CACO3 MG/L	00435 T ACDITY CACO3 MG/L	00010 WATER TEMP CENT	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00680 T ORG C C MG/L	00665 PHOS-T P-WET MG/L	00625 TOT KJEL N MG/L
72/03/07	13	40		6.10			35.5					
72/03/08	13	45		7.30			31.0					
72/03/07	13	40										
CP(T)-G					23	3		35.0	94	23.0	0.25	1.450
72/03/08	13	45										
72/03/09	13	30		5.60	2	9	38.0					
72/03/08	13	45										
CP(T)-G					13	4		80.0	26	6.0	0.32	1.000
72/03/09	13	30										
72/03/10	14	00		6.50			39.0					
72/03/09	13	30										
CP(T)-G			664.00		10	6		23.0	12	4.0	0.34	0.600
72/03/10	14	00										
72/03/11	13	35		6.20			38.0					
72/03/10	14	00										
CP(T)-G			687.00		9	5		32.0K	22	4.0	0.10	1.150
72/03/11	13	35										
72/03/12	12	45		6.30			37.0					
72/03/11	13	35										
CP(T)-G			696.00		14	5		35.0K	13	2.0	0.12	1.150
72/03/12	12	45										
72/03/13	11	40		6.40			37.0					
72/03/12	12	45										
CP(T)-G			687.00		11	3		8.0	12	2.0	0.75	0.900
72/03/13	11	40										
72/03/14	11	00		6.50			37.0					
72/03/13	11	40										
CP(T)-G			691.00		14	3		9.0	26	6.0	0.01	1.650
72/03/14	11	00										

STORET RETRIEVAL DATE 72/06/01

641006 M-03 F-033-64

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00610 NH3-N TOTAL MG/L	00630 NO2&NO3 N MG/L	00500 RESIDUE TOTAL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	00515 RESIDUE DISS-105 C MG/L	00520 RESIDUE VOL FLT MG/L
72/03/07	13	40							
CP(T)-G			0.600	0.3	107	31	15	76	34
72/03/08	13	45							
72/03/08	13	45							
CP(T)-G			0.550	0.1	51	5K		51	
72/03/09	13	30							
72/03/09	13	30							
CP(T)-G			0.600	0.1	42	5K	5K	42	8
72/03/10	14	00							
72/03/10	14	00							
CP(T)-G			0.600	0.1	48	5K	5K	48	
72/03/11	13	35							
72/03/11	13	35							
CP(T)-G			0.800	0.1	56	5K	5K	56	28
72/03/12	12	45							
72/03/12	12	45							
CP(T)-G			0.500	0.4	35	5K	5K	35	19
72/03/13	11	40							
72/03/13	11	40							
CP(T)-G			0.500	0.2	51	6	5	45	5K
72/03/14	11	00							

STORET RETRIEVAL DATE 72/06/01

641008 M-04 F-033-65

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00058 FLOW RATE GPM	00400 PH SU	00410 T ALK CACO3 MG/L	00435 T ACDITY CACO3 MG/L	00010 WATER TEMP CENT	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00680 T ORG C C MG/L	00665 PHOS-T P-WET MG/L	00625 TOT KJEL N MG/L
72/03/07	14 00			6.50			46.0					
72/03/07	13 05											
CP(T)-G			369.00		18	4		70.0K	58	8.0	0.26	0.920
72/03/08	13 30											
	14 00			6.80			37.0					
72/03/08	15 15											
CP(T)-G			369.00		9	11		68.0K	49	10.0	4.10	0.950
72/03/09	13 15											
	13 55			6.80			50.0					
72/03/09	13 15											
CP(T)-G			358.00		6	6		35.0	22	4.0	0.40	0.600
72/03/10	13 50											
	14 10			6.30			48.0					
72/03/10	13 50											
CP(T)-G			354.00		6	6		68.0K	8	3.0	0.10	0.600
72/03/11	13 15											
	13 25			6.40			49.0					
72/03/11	13 15											
CP(T)-G			351.00		6	5		70.0K	8	1.0K	0.10	0.400
72/03/12	12 20											
	12 35			6.30			48.0					
72/03/12	12 20											
CP(T)-G			348.00		7	4		2.0	16	1.0K	0.16	0.350
72/03/13	11 20											
	11 30			6.50			47.0					
72/03/14	10 45			7.20			46.0					
72/03/13	11 20											
CP(T)-G			343.00		11	4		10.0	32	6.0	0.13	0.650
72/03/14	10 45											

STORET RETRIEVAL DATE 72/06/01

641008 M-04 F-033-65

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00610 NH3-N TOTAL MG/L	00630 NO2&NO3 N MG/L	00500 RESIDUE TOTAL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	00515 RESIDUE DISS-105 C MG/L	00520 RESIDUE VOL FLT MG/L
72/03/07	13 05								
CP(T)-G			0.350	0.3	116	5		111	
72/03/08	13 30								
72/03/08	15 15								
CP(T)-G			0.250	0.3	78	16		62	
72/03/09	13 15								
72/03/09	13 15								
CP(T)-G			0.250	0.2	67	6		61	
72/03/10	13 50								
72/03/10	13 50								
CP(T)-G			0.200	0.3	44	5K		44	
72/03/11	13 15								
72/03/11	13 15								
CP(T)-G			0.250	0.3	43	5K		43	
72/03/12	12 20								
72/03/12	12 20								
CP(T)-G			0.150	0.3	47	5K		47	
72/03/13	11 20								
72/03/13	11 20								
CP(T)-G			0.200	0.3	23	6		17	
72/03/14	10 45								

STORET RETRIEVAL DATE 72/06/01

641010 M-05 F-033-66

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00058 FLOW RATE GPM	00400 PH SU	00410 T ALK CACO3 MG/L	00435 T ACDITY CACO3 MG/L	00010 WATER TEMP CENT	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00680 T ORG C C MG/L	00665 PHOS-T P-WET MG/L	00625 TOT KJEL N MG/L
72/03/08	09 45		24200.00	9.10	42	0	26.0	28.0	82	24.0	0.57	5.100
72/03/09	08 50		23300.00	6.60	10	7	26.0	14.0K	24	9.0	0.21	2.000
72/03/10	09 00		20700.00	6.80	14	4	25.0	2.4	21	10.0	0.22	1.900
72/03/11	08 55		21600.00	9.30	35	0	27.0	13.0K	52	8.0	0.26	1.650
72/03/12	09 25		21600.00	9.00	27	0	28.0	15.0K	30	9.0	0.48	1.300
72/03/13	09 05		22400.00	10.00	58	0	27.0	15.0K	24	8.0	0.18	0.770
72/03/14	09 00		24200.00	7.90	20	0	28.0	8.0	39	12.0	0.14	1.150

DATE FROM TO	TIME OF DAY	DEPTH FEET	00610 NH3-N TOTAL MG/L	00630 NO2&NO3 N MG/L	00500 RESIDUE TOTAL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	00515 RESIDUE DISS-105 C MG/L	00520 RESIDUE VOL FLT MG/L
72/03/08	09 45		3.500	2.6	323	37		286	
72/03/09	08 50		1.300	1.5	213	12		201	
72/03/10	09 00		1.200	1.4	140	26		114	
72/03/11	08 55		1.200	1.0	144	14		130	
72/03/12	09 25		0.550	1.3	140	11		129	
72/03/13	09 05		0.300	1.2	160	10		150	
72/03/14	09 00		0.500	1.3	152	16		136	

STORET RETRIEVAL DATE 72/06/01

641012 M-06 F-033-67

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00058 FLOW RATE GPM	00400 PH SU	00410 T ALK CACO3 MG/L	00435 T ACDITY CACO3 MG/L	00010 WATER TEMP CENT	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00680 T ORG C C MG/L	00665 PHOS-T P-WET MG/L	00625 TOT KJEL N MG/L
72/03/07	08 40			6.20			26.0					
72/03/08	09 00			9.50			28.0					
72/03/07	08 35											
CP(T)-G			24200.00		19	3		7.0	54	12.0	0.30	2.000
72/03/08	09 00											
72/03/09	09 00			5.30			26.0					
72/03/08	09 00											
CP(T)-G			23300.00		30	0		4.0	27	9.0	0.28	1.650
72/03/09	09 00											
72/03/10	09 05			9.00			26.0					
72/03/09	09 00											
CP(T)-G			20700.00		25	0		6.0	34	10.0	0.24	1.800
72/03/10	09 05											
72/03/11	09 00			8.20			28.0					
72/03/10	09 05											
CP(T)-G			21600.00		27	0		14.0K	57	8.0	0.25	1.650
72/03/11	09 00											
72/03/12	09 30			6.90			28.0					
72/03/11	09 00											
CP(T)-G			21600.00		24	3		35.0K	27	11.0	0.44	1.450
72/03/12	09 30											
72/03/13	09 15			3.60			27.0					
72/03/12	09 30											
CP(T)-G			22400.00		32	4		4.5	31	10.0	0.17	1.050
72/03/13	09 15											
72/03/14	09 15			7.90			29.0					
72/03/13	09 15											
CP(T)-G			24200.00		7	5		4.4	35	9.0	0.15	1.250
72/03/14	09 15											

STORET RETRIEVAL DATE 72/06/01

641012 M-06 F-033-67

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00610 NH3-N TOTAL MG/L	00630 NO2&NO3 N MG/L	00500 RESIDUE TOTAL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	00515 RESIDUE DISS-105 C MG/L	00520 RESIDUE VOL FLT MG/L
72/03/07	08	35							
CP(T)-G			0.950	1.4	248	21	8	227	69
72/03/08	09	00							
72/03/08	09	00							
CP(T)-G			1.100	1.4	149	18	6	131	32
72/03/09	09	00							
72/03/09	09	00							
CP(T)-G			0.950	1.3	148	25	6	123	41
72/03/10	09	05							
72/03/10	09	05							
CP(T)-G			1.250	1.0	165	18	5K	147	46
72/03/11	09	00							
72/03/11	09	00							
CP(T)-G			0.500	1.5	183	20	5K	163	51
72/03/12	09	30							
72/03/12	09	30							
CP(T)-G			0.350	1.0	144	9	5	135	64
72/03/13	09	15							
72/03/13	09	15							
CP(T)-G			0.450	1.1	148	14	5	134	
72/03/14	09	15							

STORET RETRIEVAL DATE 72/06/01

641014 M-07 F-033-68

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

MONSANTO CHEMICAL COMPANY
MARCH, 1972

DATE FROM TO	TIME OF DAY	DEPTH FEET	00058 FLOW RATE GPM	00400 PH SU	00410 T ALK CACO3 MG/L	00435 T ACDITY CACO3 MG/L	00010 WATER TEMP CENT	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00680 T ORG C C MG/L	00665 PHOS-T P-WET MG/L	00625 TOT KJEL N MG/L
72/03/08	09	20	267.00	11.70	1460	0	21.5	14.0K	34	3.0	0.26	0.650
72/03/09	09	15	117.00	1.90	0	6050	20.0	2.4	12	2.0	0.20	0.200
72/03/10	09	15	208.00	11.50	119	0	19.0	15.0K	13	1.0K	0.09	0.200
72/03/11	09	15	233.00	11.20	1040	0	21.0	13.0K	28	1.0K	0.02	0.200
72/03/12	09	45	117.00	11.10	3400	0	22.0	15.0K	12	70.0	0.07	1.050
72/03/13	09	25	233.00	2.10	0	26	22.0	1.0K	8	2.0	0.15	0.150
72/03/14	09	20	142.00	11.80	12	0	22.5	2.2	7	1.0K	0.03	0.200

DATE FROM TO	TIME OF DAY	DEPTH FEET	00610 NH3-N TOTAL MG/L	00630 NO2&NO3 N MG/L	00500 RESIDUE TOTAL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	00515 RESIDUE DISS-105 C MG/L	00520 RESIDUE VOL FLT MG/L
72/03/08	09	20	0.350	1.8	2550	44		2506	
72/03/09	09	15	0.100	0.8	6480	17		6463	
72/03/10	09	15	0.010	15.0	1920	8		1912	
72/03/11	09	15	0.050	0.4	1180	8		1172	
72/03/12	09	45	0.010	35.0	5100	9		5091	
72/03/13	09	25	0.100	0.6	4980	9		4971	
72/03/14	09	20	0.100	1.3	2090	25		2065	

STORET RETRIEVAL DATE 72/06/01

641016 M-08 F-033-69

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00058 FLOW RATE GPM	00400 PH SU	00410 T ALK CACO3 MG/L	00435 T ACDITY CACO3 MG/L	00010 WATER TEMP CENT	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00680 T ORG C C MG/L	00665 PHOS-T P-WET MG/L	00625 TOT KJEL N MG/L
72/03/07	08	55		6.10			26.5					
72/03/08	09	20		7.80			27.0					
72/03/07	08	55										
CP(T)-G			7580.00		12	4		35.0K	48	8.0	0.05	0.650
72/03/08	09	20										
72/03/09	09	25		6.20			26.0					
72/03/08	09	20										
CP(T)-G			8730.00		17	4		34.0K	25	9.0	0.06	1.100
72/03/09	09	25										
72/03/10	09	30		6.70			26.0					
72/03/09	09	25										
CP(T)-G			6440.00		14	5		12.0	34	12.0	0.08	0.750
72/03/10	09	30										
72/03/11	09	25	7570.00	6.90	10	7	32.0	32.0K	29	8.0	0.10	0.700
72/03/12	09	50		7.90			28.0					
72/03/11	09	25										
CP(T)-G			8040.00		11	5		36.0K	29	8.0	0.14	0.820
72/03/12	09	50										
72/03/13	09	30		6.60			27.0					
72/03/12	09	50										
CP(T)-G			10700.00		14	4		1.8	28	9.0	0.10	0.550
72/03/13	09	30										
72/03/14	09	25		8.40			30.0					
72/03/13	09	30										
CP(T)-G			6780.00		12	5		1.6	28	8.0	0.08	0.600
72/03/14	09	25										

STORET RETRIEVAL DATE 72/06/01

641016 M-08 F-033-69

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00610 NH3-N TOTAL MG/L	00630 NO2&NO3 N MG/L	00500 RESIDUE TOTAL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	00515 RESIDUE DISS-105 C MG/L	00520 RESIDUE VOL FLT MG/L
72/03/07	08 55								
CP(T)-G			0.250	0.5	320	5		315	
72/03/08	09 20								
72/03/08	09 20								
CP(T)-G			0.550	0.5	146	17		129	
72/03/09	09 25								
72/03/09	09 25								
CP(T)-G			0.200	0.5	91	11		80	
72/03/10	09 30								
72/03/11	09 25		0.400	0.5	95	16		79	
72/03/11	09 25								
CP(T)-G			0.300	0.2	94	21		73	
72/03/12	09 50								
72/03/12	09 50								
CP(T)-G			0.350	0.5	83	18		65	
72/03/13	09 30								
72/03/13	09 30								
CP(T)-G			0.250	0.3	89	9		80	
72/03/14	09 25								

STORET RETRIEVAL DATE 72/06/01

641018 M-09 F-033-70

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00058 FLOW RATE GPM	00400 PH SU	00410 T ALK CACO3 MG/L	00435 T ACDITY CACO3 MG/L	00010 WATER TEMP CENT	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00680 T ORG C C MG/L	00665 PHOS-T P-WET MG/L	00625 TOT KJEL N MG/L
72/03/07	12	35		3.40			29.5					
72/03/08	13	05		4.80			28.0					
72/03/07	12	40										
CP(T)-G			118.00		0	82		112.0	213	53.0	1.36	13.500
72/03/08	13	05										
72/03/09	12	50		2.60			36.0					
72/03/08	13	05										
CP(T)-G			129.00		0	490		166.0L	4640	2200.0	1.26	10.700
72/03/09	12	50										
72/03/10	13	10		2.70			31.0					
72/03/09	12	50										
CP(T)-G			36.00		0	902		164.0L	5710	1500.0	0.94	11.800
72/03/10	13	10										
72/03/11	12	45		4.30	0	5	30.0	15.0K	148	37.0	1.35	12.300
72/03/12	08	45		5.00	2	32	29.0	35.0	97	20.0	1.70	13.000
72/03/13	08	30		4.50	2	28	30.0	65.0	121	23.0	0.93	8.500
72/03/14	08	40		6.60	18	28	33.0	50.0	86	19.0	1.49	580.000

STORET RETRIEVAL DATE 72/06/01

641018 M-09 F-033-70

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00610 NH3-N TOTAL MG/L	00630 NO2&NO3 N MG/L	00500 RESIDUE TOTAL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	00515 RESIDUE DISS-105 C MG/L	00520 RESIDUE VOL FLT MG/L
72/03/07	12 40								
CP(T)-G			5.000	100.0	409	5K		409	
72/03/08	13 05								
72/03/08	13 05								
CP(T)-G			6.000	100.0	959	15		944	
72/03/09	12 50								
72/03/09	12 50								
CP(T)-G			4.500	250.0	1125	24		1101	
72/03/10	13 10		7.500	150.0	392	16		376	
72/03/11	12 45		7.500	150.0	323	13		310	
72/03/12	08 45		3.750	250.0	275	11		264	
72/03/13	08 30		115.000	1250.0	319	5		314	
72/03/14	08 40								

STORET RETRIEVAL DATE 72/06/01

641020 M-10 F-033-71

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00058 FLOW RATE GPM	00400 PH SU	00410 T ALK CACO3 MG/L	00435 T ACDITY CACO3 MG/L	00010 WATER TEMP CENT	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00680 T ORG C C MG/L	00665 PHOS-T P-WET MG/L	00625 TOT KJEL N MG/L
72/03/07	11	30		6.80			27.0					
72/03/08	12	30		6.90			26.0					
72/03/07	11	45										
CP(T)-G			1150.00		13	5		35.0K	23	10.0	0.04	0.500
72/03/08	12	30										
72/03/09	12	30		7.10			26.0					
72/03/08	12	30										
CP(T)-G			1050.00		12	4		35.0K	31	10.0	0.06	0.360
72/03/09	12	30										
72/03/10	13	00		6.70			28.0					
72/03/09	12	30										
CP(T)-G			1100.00		11	4		36.0K	18	9.0	0.04	0.300
72/03/10	13	00										
72/03/11	12	40		6.90			27.0					
72/03/10	13	00										
CP(T)-G			983.00		10	4		35.0K	26	7.0	0.06	0.600
72/03/11	12	40										
72/03/12	12	05		7.20			28.0					
72/03/11	12	40										
CP(T)-G			958.00		9	4		35.0K	28	8.0	0.12	0.250
72/03/12	12	05										
72/03/13	11	10		6.70			29.0					
72/03/12	12	05										
CP(T)-G			1020.00		12	2		2.2	31	8.0	0.04	0.300
72/03/13	11	10										
72/03/14	10	30		7.10			29.0					
72/03/13	11	10										
CP(T)-G			1030.00		11	5		1.0K	28	8.0	0.07	0.410
72/03/14	10	30										

STORET RETRIEVAL DATE 72/06/01

641020 M-10 F-033-71

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00610 NH3-N TOTAL MG/L	00630 NO2&NO3 N MG/L	00500 RESIDUE TOTAL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	00515 RESIDUE DISS-105 C MG/L	00520 RESIDUE VOL FLT MG/L
72/03/07	11 45								
CP(T)-G			0.200	0.1	80	5K		80	
72/03/08	12 30								
72/03/08	12 30								
CP(T)-G			0.100	0.1	74	10		64	
72/03/09	12 30								
72/03/09	12 30								
CP(T)-G			0.150	0.1	214	12		202	
72/03/10	13 00								
72/03/10	13 00								
CP(T)-G			0.250	0.1	88	9		79	
72/03/11	12 40								
72/03/11	12 40								
CP(T)-G			0.100	0.1	86	15		71	
72/03/12	12 05								
72/03/12	12 05								
CP(T)-G			0.100	0.1	53	9		44	
72/03/13	11 10								
72/03/13	11 10								
CP(T)-G			0.200	0.1	66	8		58	
72/03/14	10 30								

STORET RETRIEVAL DATE 72/06/01

641022 M-11 F-033-72

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00058 FLOW RATE GPM	00400 PH SU	00410 T ALK CACO3 MG/L	00435 T ACDITY CACO3 MG/L	00010 WATER TEMP CENT	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00680 T ORG C C MG/L	00665 PHOS-T P-WET MG/L	00625 TOT KJEL N MG/L
72/03/08	10	00		6.50	220	17	17.0	12.0	54	17.0	2.30	9.850
72/03/09	09	30		6.30	58	22	16.0	15.0K	36	8.0	1.30	27.000
72/03/10	09	35		7.10	75	24	17.0	28.0	30	8.0	1.92	40.500
72/03/11	09	40		6.80	68	34	20.0	7.0	35	7.0	4.50	38.400
72/03/12	10	00		5.80	29	44	21.0	156.0L	210	70.0	5.25	19.900
72/03/13	09	30		6.00	24	15	20.0	4.4	51	9.0	1.12	3.400
72/03/14	09	30		7.30	48	22	22.0	9.0	41	8.0	1.88	28.000

DATE FROM TO	TIME OF DAY	DEPTH FEET	00610 NH3-N TOTAL MG/L	00630 NO2&NO3 N MG/L	00500 RESIDUE TOTAL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	00515 RESIDUE DISS-105 C MG/L	00520 RESIDUE VOL FLT MG/L
72/03/08	10	00	7.000	15.0	540	50		490	
72/03/09	09	30	25.000	25.0	1100	8		1092	
72/03/10	09	35	40.000	40.0	1680	6		1674	
72/03/11	09	40	30.000	45.0	2020	10		2010	
72/03/12	10	00	5.100	1.2	2640	15		2625	
72/03/13	09	30	2.100	25.0	2930	62		2868	
72/03/14	09	30	19.000	40.0	2320	7		2313	

STORET RETRIEVAL DATE 72/06/01

641024 M-12 F-033-73

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00058 FLOW RATE GPM	00400 PH SU	00410 T ALK CACO3 MG/L	00435 T ACDITY CACO3 MG/L	00010 WATER TEMP CENT	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00680 T ORG C C MG/L	00665 PHOS-T P-WET MG/L	00625 TOT KJEL N MG/L
72/03/09	09 50			6.70			15.0					
72/03/10	09 50			6.80			17.0					
72/03/09	09 50											
CP(T)-G			390.00		11	7		26.0	119	23.0	1.84	5.350
72/03/10	09 50											

DATE FROM TO	TIME OF DAY	DEPTH FEET	00610 NH3-N TOTAL MG/L	00630 NO2&NO3 N MG/L	00500 RESIDUE TOTAL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	00515 RESIDUE DISS-105 C MG/L	00520 RESIDUE VOL FLT MG/L
72/03/09	09 50								
CP(T)-G			2.100	0.3	148	28		120	
72/03/10	09 50								

STORET RETRIEVAL DATE 72/06/01

641026 M-13 F-033-74

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00058 FLOW RATE GPM	00400 PH SU	00410 T ALK CACO3 MG/L	00435 T ACDITY CACO3 MG/L	00010 WATER TEMP CENT	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00680 T ORG C C MG/L	00665 PHOS-T P-WET MG/L	00625 TOT KJEL N MG/L
72/03/07	09	20		6.50			28.5					
72/03/08	10	20		6.60			31.0					
72/03/07	09	20										
CP(T)-G			3330.00		12	3		21.0	35	14.0	0.07	1.300
72/03/08	10	20										
72/03/09	10	30		6.90			30.0					
72/03/08	10	20										
CP(T)-G			3520.00		13	4		25.0	40	10.0	0.06	0.900
72/03/09	10	30										
72/03/10	10	35		6.60			25.0					
72/03/09	10	30										
CP(T)-G			3390.00		12	3		34.0K	40	11.0	0.07	1.350
72/03/10	10	35										
72/03/11	10	10		6.80			28.0					
72/03/10	10	35										
CP(T)-G			3560.00		12	39		34.0K	36	7.0	0.14	1.150
72/03/11	10	10										
72/03/12	10	15		7.00			29.0					
72/03/11	10	10										
CP(T)-G			3490.00		7	3		35.0K	20	10.0	0.03	0.700
72/03/12	10	15										
72/03/13	09	50		6.50			28.0					
72/03/12	10	15										
CP(T)-G			3630.00		12	3		2.6	31	10.0	0.05	0.650
72/03/13	09	50										
72/03/14	09	40		6.50			33.0					
72/03/13	09	50										
CP(T)-G			3560.00		11	5		1.6	45	12.0	0.06	0.750
72/03/14	09	40										

STORET RETRIEVAL DATE 72/06/01

641026 M-13 F-033-74

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00610 NH3-N TOTAL MG/L	00630 NO2&NO3 N MG/L	00500 RESIDUE TOTAL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	00515 RESIDUE DISS-105 C MG/L	00520 RESIDUE VOL FLT MG/L
72/03/07	09	20							
CP(T)-G			0.700	1.3	83	15		68	
72/03/08	10	20							
72/03/08	10	20							
CP(T)-G			0.400	0.5	78	6		72	
72/03/09	10	30							
72/03/09	10	30							
CP(T)-G			0.450	0.6	85	8		77	
72/03/10	10	35							
72/03/10	10	35							
CP(T)-G			0.850	0.5	95	10		85	
72/03/11	10	10							
72/03/11	10	10							
CP(T)-G			0.350	0.1	90	15		75	
72/03/12	10	15							
72/03/12	10	15							
CP(T)-G			0.350	0.8	54	11		43	
72/03/13	09	50							
72/03/13	09	50							
CP(T)-G			0.300	0.8	69	9		60	
72/03/14	09	40							

STORET RETRIEVAL DATE 72/06/01

641028 M-14 F-033-75

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00058 FLOW RATE GPM	00400 PH SU	00410 T ALK CACO3 MG/L	00435 T ACDITY CACO3 MG/L	00010 WATER TEMP CENT	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00680 T ORG C C MG/L	00665 PHOS-T P-WET MG/L	00625 TOT KJEL N MG/L
72/03/08	10	25		6.60	13	11	20.0	20.0	57	17.0	0.24	2.750
72/03/09	10	35		6.40	8	11	21.0	60.0	127	32.0	0.18	1.200
72/03/10	10	40		6.70	9	4	21.0	32.0	72	17.0	0.03	0.300
72/03/11	10	20		6.30	7	45	33.0	21.0	48	9.0	0.11	0.250
72/03/12	10	20		6.60	6	5	26.0	35.0K	72	14.0	0.08	0.270
72/03/13	09	55		6.60	11	3	24.0	38.0	70	13.0	0.05	0.320
72/03/14	09	45		4.40	6	12	24.0	86.0L	126	31.0	0.04	0.400

DATE FROM TO	TIME OF DAY	DEPTH FEET	00610 NH3-N TOTAL MG/L	00630 NO2&NO3 N MG/L	00500 RESIDUE TOTAL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	00515 RESIDUE DISS-105 C MG/L	00520 RESIDUE VOL FLT MG/L
72/03/08	10	25	1.950	6.0	124	9		115	
72/03/09	10	35	0.150	2.1	113	27		86	
72/03/10	10	40	0.050	0.1	78	10		68	
72/03/11	10	20	0.005K	0.1	77	11		66	
72/03/12	10	20	0.005	0.5	78	14		64	
72/03/13	09	55	0.050	0.1	83	34		49	
72/03/14	09	45	0.050	0.2	87	18		69	

STORET RETRIEVAL DATE 72/06/01

641030 M-15 F-033-76

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00058 FLOW RATE GPM	00400 PH SU	00410 T ALK CACO3 MG/L	00435 T ACDITY CACO3 MG/L	00010 WATER TEMP CENT	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00680 T ORG C C MG/L	00665 PHOS-T P-WET MG/L	00625 TOT KJEL N MG/L
72/03/07	12	50		7.00			28.0					
	14	30		6.70			28.0					
72/03/07	15	55										
CP(T)-G					13	3		50.0	25	11.0	0.10	0.900
72/03/08	12	50										
72/03/09	14	00		7.00			28.0					
72/03/08	14	45										
CP(T)-G					13	3		35.0K	40	9.0	0.10	0.600
72/03/09	14	00										
72/03/10	14	20		8.90			28.0					
72/03/09	14	00										
CP(T)-G			2530.00		11	5		35.0K	31	10.0	0.11	1.100
72/03/10	14	20										
72/03/11	13	45		6.70			31.0					
72/03/10	14	20										
CP(T)-G			2880.00		16	5		33.0K	28	9.0	0.10	1.250
72/03/11	13	45										
72/03/12	12	55		6.80			30.0					
72/03/11	13	45										
CP(T)-G			2890.00		9	5		35.0K	40	9.0	0.19	0.650
72/03/12	12	55										
72/03/13	12	45		6.90			32.0					
72/03/12	12	55										
CP(T)-G			3010.00		12	2		2.8	35	9.0	0.10	0.600
72/03/13	12	45										
72/03/14	10	20		7.00			34.0					
72/03/13	12	45										
CP(T)-G			2870.00		12	4		1.0K	40	8.0	0.06	0.700
72/03/14	10	20										

STORET RETRIEVAL DATE 72/06/01

641030 M-15 F-033-76

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00610 NH3-N TOTAL MG/L	00630 NO2&NO3 N MG/L	00500 RESIDUE TOTAL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	00515 RESIDUE DISS-105 C MG/L	00520 RESIDUE VOL FLT MG/L
72/03/07	15 55								
CP(T)-G			0.400	0.9	70	5K		70	
72/03/08	12 50								
72/03/08	14 45								
CP(T)-G			0.250	0.3	79	14		65	
72/03/09	14 00								
72/03/09	14 00								
CP(T)-G			0.350	0.1	105	19		86	
72/03/10	14 20								
72/03/10	14 20								
CP(T)-G			0.750	0.3	100	15		85	
72/03/11	13 45								
72/03/11	13 45								
CP(T)-G			0.250	0.2	87	21		66	
72/03/12	12 55								
72/03/12	12 55								
CP(T)-G			0.250	0.2	69	15		54	
72/03/13	12 45								
72/03/13	12 45								
CP(T)-G			0.250	0.3	71	10		61	
72/03/14	10 20								

STORET RETRIEVAL DATE 72/06/01

641032 M-16 F-033-77

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00058 FLOW RATE GPM	00400 PH SU	00410 T ALK CACO3 MG/L	00435 T ACDITY CACO3 MG/L	00010 WATER TEMP CENT	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00680 T ORG C C MG/L	00665 PHOS-T P-WET MG/L	00625 TOT KJEL N MG/L
72/03/07	09	15		6.20			21.0					
72/03/08	10	15		5.90			24.0					
72/03/07	09	15										
CP(T)-G			4980.00		10	6		30.0	41	13.0	0.28	2.500
72/03/08	10	15										
72/03/09	10	20		6.50			22.0					
72/03/08	10	15										
CP(T)-G			4670.00		10	3		35.0K	31	8.0	0.11	0.550
72/03/09	10	20										
72/03/10	10	30		6.40			21.0					
72/03/09	10	20										
CP(T)-G			4540.00		9	3		35.0K	28	10.0	0.05	0.350
72/03/10	10	30										
72/03/11	10	05	4630.00	6.80	7	5	22.0	34.0K	29	9.0	0.06	0.400
72/03/12	10	10		6.90			22.0					
72/03/11	10	05										
CP(T)-G			4660.00		7	3		35.0K	23	8.0	0.10	0.250
72/03/12	10	10										
72/03/13	09	45		6.20			23.0					
72/03/12	10	10										
CP(T)-G			4680.00		7	3		3.2	23	8.0	0.01K	0.350
72/03/13	09	45										
72/03/14	09	35		6.50			25.0					
72/03/13	09	45										
CP(T)-G			4610.00		7	4		5.0	28	8.0	0.06	0.550
72/03/14	09	35										

STORET RETRIEVAL DATE 72/06/01

641032 M-16 F-033-77

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00610 NH3-N TOTAL MG/L	00630 NO2&NO3 N MG/L	00500 RESIDUE TOTAL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	00515 RESIDUE DISS-105 C MG/L	00520 RESIDUE VOL FLT MG/L
72/03/07	09	15							
CP(T)-G			0.600	1.2	70	7		63	
72/03/08	10	15							
72/03/08	10	15							
CP(T)-G			0.150	0.8	72	12		60	
72/03/09	10	20							
72/03/09	10	20							
CP(T)-G			0.005	0.3	78	7		71	
72/03/10	10	30							
72/03/11	10	05	0.050	0.3	84	15		69	
72/03/11	10	05							
CP(T)-G			0.005	0.1	80	17		63	
72/03/12	10	10							
72/03/12	10	10							
CP(T)-G			0.100	1.0	72	10		62	
72/03/13	09	45							
72/03/13	09	45							
CP(T)-G			0.100	1.0	86	9		77	
72/03/14	09	35							

STORET RETRIEVAL DATE 72/06/01

641033 M-17 F-033-78

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00058 FLOW RATE GPM	00400 PH SU	00410 T ALK CACO3 MG/L	00435 T ACDITY CACO3 MG/L	00010 WATER TEMP CENT	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00680 T ORG C C MG/L	00665 PHOS-T P-WET MG/L	00625 TOT KJEL N MG/L
72/03/08	11 00		800.00	6.10	3	7	33.0	1.0	21	7.0	0.04	0.750
72/03/09	10 45		800.00	6.30	6	7	27.0	8.0K	24	9.0	0.04	0.500
72/03/10	11 00		800.00	6.30	9	6	28.0	4.0	30	10.0	0.04	0.500
72/03/11	10 30		800.00	5.90	5	6	32.0	7.0K	27	7.0	0.05	0.450
72/03/12	10 30		800.00	5.90	3	6	32.0	1.0K	20	7.0	0.06	0.420
72/03/13	10 10		800.00	4.00	0	8	33.0	1.3	23	6.0	0.01K	0.700
72/03/14	09 50		800.00	5.50	4	5	40.0	2.0	28	7.0	0.04	0.550

DATE FROM TO	TIME OF DAY	DEPTH FEET	00610 NH3-N TOTAL MG/L	00630 NO2&NO3 N MG/L	00500 RESIDUE TOTAL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	00515 RESIDUE DISS-105 C MG/L	00520 RESIDUE VOL FLT MG/L
72/03/08	11 00		0.250	2.5	85	8		77	
72/03/09	10 45		0.150	1.6	76	8		68	
72/03/10	11 00		0.150	15.0	82	9		73	
72/03/11	10 30		0.150	30.0	74	13		61	
72/03/12	10 30		0.010	15.0	88	14		74	
72/03/13	10 10		0.150	15.0	74	11		63	
72/03/14	09 50		0.050	1.8	64	10		54	

STORET RETRIEVAL DATE 72/06/01

641034 M-18 F-033-79

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
11135000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00058 FLOW RATE GPM	00400 PH SU	00410 T ALK CACO3 MG/L	00435 T ACDITY CACO3 MG/L	00010 WATER TEMP CENT	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00680 T ORG C C MG/L	00665 PHOS-T P-WET MG/L	00625 TOT KJEL N MG/L
72/03/07	09 45			6.30			20.0					
72/03/08	10 40			5.80			20.0					
72/03/07	10 40											
CP(T)-G			2170.00		12	4		1.6	28	10.0	0.04	0.380
72/03/08	10 40											
72/03/09	11 00			6.60			19.0					
72/03/08	10 40											
CP(T)-G			1770.00		11	3		2.0	28	10.0	0.03	0.500
72/03/09	11 00											
72/03/10	11 15			6.50			28.0					
72/03/09	11 00											
CP(T)-G			1770.00		11	5		3.0	30	9.0	0.04	0.250
72/03/10	11 15											
72/03/11	10 50			6.60			20.0					
72/03/10	11 15											
CP(T)-G			1770.00		9	5		2.0	30	8.0	0.05	0.450
72/03/11	10 50											
72/03/12	10 40			7.00			20.0					
72/03/11	10 50											
CP(T)-G			1820.00		8	4		12.0	22	7.0	0.06	0.200
72/03/12	10 40											
72/03/13	10 25			6.70			20.0					
72/03/12	10 40											
CP(T)-G			1820.00		9	3		2.9	23	7.0	0.06	0.300
72/03/13	10 25											
72/03/14	10 05			6.60			22.5					
72/03/13	10 25											
CP(T)-G			1770.00		11	4		4.0	26	9.0	0.04	0.450
72/03/14	10 05											

STORET RETRIEVAL DATE 72/06/01

641034 M-18 F-033-79

MONSANTO CHEMICAL COMPANY
MARCH. 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00610 NH3-N TOTAL MG/L	00630 NO2&NO3 N MG/L	00500 RESIDUE TOTAL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	00515 RESIDUE DISS-105 C MG/L	00520 RESIDUE VOL FLT MG/L
72/03/07	10	40							
CP(T)-G			0.050	0.3	51	5K		51	
72/03/08	10	40							
72/03/08	10	40							
CP(T)-G			0.150	0.2	71	9		62	
72/03/09	11	00							
72/03/09	11	00							
CP(T)-G			0.050	0.1	69	9		60	
72/03/10	11	15							
72/03/10	11	15							
CP(T)-G			0.005K	0.1	87	13		74	
72/03/11	10	50							
72/03/11	10	50							
CP(T)-G			0.005K	0.1	80	15		65	
72/03/12	10	40							
72/03/12	10	40							
CP(T)-G			0.005	0.1	64	15		49	
72/03/13	10	25							
72/03/13	10	25							
CP(T)-G			0.150	0.1	61	9		52	
72/03/14	10	05							

STORET RETRIEVAL DATE 72/06/01

641036 M-19 F-033-80

MONSANTO CHEMICAL COMPANY
MARCH. 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00058 FLOW RATE GPM	00400 PH SU	00410 T ALK CACO3 MG/L	00435 T ACDITY CACO3 MG/L	00010 WATER TEMP CENT	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00680 T ORG C C MG/L	00665 PHOS-T P-WET MG/L	00625 TOT KJEL N MG/L
72/03/07	09	50		6.50			18.5					
72/03/08	10	35		6.80			19.0					
72/03/07	10	20										
CP(T)-G			1920.00		10	5		2.0	32	9.0	0.03	0.300
72/03/08	10	35										
72/03/09	10	55		6.30			18.0					
72/03/08	10	35										
CP(T)-G			2010.00		11	4		2.2	28	10.0	0.04	0.400
72/03/09	10	55										
72/03/10	11	10		6.30			28.0					
72/03/09	10	55										
CP(T)-G			1880.00		9	5		5.0	30	8.0	0.04	0.250
72/03/10	11	10										
72/03/11	10	45		6.40			18.0					
72/03/10	11	10										
CP(T)-G			1970.00		3	6		3.0	29	8.0	0.05	0.350
72/03/11	10	45										
72/03/12	10	35		6.50			19.0					
72/03/11	10	45										
CP(T)-G			1950.00		7	5		4.0	25	9.0	0.08	0.200
72/03/12	10	35										
72/03/13	10	20		6.60			20.0					
72/03/12	10	35										
CP(T)-G			1970.00		11	4		3.7	24	9.0	0.09	0.250
72/03/13	10	20										
72/03/14	10	00		6.50			20.5					
72/03/13	10	20										
CP(T)-G			1950.00		9	4		2.6	29	9.0	0.04	0.270
72/03/14	10	00										

STORET RETRIEVAL DATE 72/06/01

641036 M-19 F-033-80

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00610 NH3-N TOTAL MG/L	00630 NO2&NO3 N MG/L	00500 RESIDUE TOTAL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	00515 RESIDUE DISS-105 C MG/L	00520 RESIDUE VOL FLT MG/L
72/03/07	10	20							
CP(T)-G			0.050	0.2	66	6		60	
72/03/08	10	35							
72/03/08	10	35							
CP(T)-G			0.200	0.2	70	9		61	
72/03/09	10	55							
72/03/09	10	55							
CP(T)-G			0.050	0.1	69	19		50	
72/03/10	11	10							
72/03/10	11	10							
CP(T)-G			0.005K	0.1	90	17		73	
72/03/11	10	45							
72/03/11	10	45							
CP(T)-G			0.005	0.1	80	17		63	
72/03/12	10	35							
72/03/12	10	35							
CP(T)-G			0.050	0.2	51	12		39	
72/03/13	10	20							
72/03/13	10	20							
CP(T)-G			0.005	0.2	56	10		46	
72/03/14	10	00							

STORET RETRIEVAL DATE 72/06/01

641038 M-20 F-033-81

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
11135000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00058 FLOW RATE GPM	00400 PH SU	00410 T ALK CACO3 MG/L	00435 T ACDITY CACO3 MG/L	00010 WATER TEMP CENT	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00680 T ORG C C MG/L	00665 PHOS-T P-WET MG/L	00625 TOT KJEL N MG/L
72/03/07	14	10		7.10			60.5					
72/03/08	14	15		7.60			56.0					
72/03/07	14	10										
CP(T)-G					12	10		31.0L	484	180.0	1.93	56.000
72/03/08	14	15										
72/03/09	14	30			1	9	57.0	11.0	28	8.0	0.35	2.450
72/03/10	11	25			3	8	64.5	1.2	25	6.0	0.04	0.410
72/03/11	11	00		5.70	3	7	60.0	5.0	22	6.0	0.14	1.050
72/03/12	10	50		6.90	5	5	54.0	5.0	12	3.0	0.29	1.500
72/03/13	10	30		6.70	6	3	60.0	35.0K	9	4.0	0.18	2.070
72/03/14	10	15		9.00	53	0	60.0	98.0	150	32.0	0.21	1.150

DATE FROM TO	TIME OF DAY	DEPTH FEET	00610 NH3-N TOTAL MG/L	00630 NO2&NO3 N MG/L	00500 RESIDUE TOTAL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	00515 RESIDUE DISS-105 C MG/L	00520 RESIDUE VOL FLT MG/L
72/03/07	14	10							
CP(T)-G			6.500	1.8	71	19		52	
72/03/08	14	15							
72/03/09	14	30	1.100	0.1	5	5	5K	5K	
72/03/10	11	25	0.250	0.1	36	8		28	
72/03/11	11	00	0.600	0.6	25	5K		25	
72/03/12	10	50	0.750	1.3	26	5K		26	
72/03/13	10	30	0.400	0.3	11	5K		11	
72/03/14	10	15	0.200	0.1	10	5K		10	

STORET RETRIEVAL DATE 72/06/01

641040 M-21 F-033-82

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00058 FLOW RATE GPM	00400 PH SU	00410 T ALK CACO3 MG/L	00435 T ACDITY CACO3 MG/L	00010 WATER TEMP CENT	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00680 T ORG C C MG/L	00665 PHOS-T P-WET MG/L	00625 TOT KJEL N MG/L
72/03/08	12	40			6	5	22.0	8.0K	12	1.0K	0.01	0.270
72/03/09	11	20		6.80	5	5	23.0	8.0K	4	1.0K	0.02	0.150

DATE FROM TO	TIME OF DAY	DEPTH FEET	00610 NH3-N TOTAL MG/L	00630 NO2&NO3 N MG/L	00500 RESIDUE TOTAL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	00515 RESIDUE DISS-105 C MG/L	00520 RESIDUE VOL FLT MG/L
72/03/08	12	40	0.250	0.3	42	5K		42	
72/03/09	11	20	0.100	0.1	44	5K		44	

STORET RETRIEVAL DATE 72/06/01

641042 M-22 F-033-83

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00058 FLOW RATE GPM	00400 PH SU	00410 T ALK CACO3 MG/L	00435 T ACDITY CACO3 MG/L	00010 WATER TEMP CENT	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00680 T ORG C C MG/L	00665 PHOS-T P-WET MG/L	00625 TOT KJEL N MG/L
72/03/09	10	05		7.10			24.0					
72/03/10	10	05		7.10			25.0					
72/03/09	10	05										
CP(T)-G					30	16		110.0	265	37.0	4.13	9.900
72/03/10	10	05										

DATE FROM TO	TIME OF DAY	DEPTH FEET	00610 NH3-N TOTAL MG/L	00630 NO2&NO3 N MG/L	00500 RESIDUE TOTAL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	00515 RESIDUE DISS-105 C MG/L	00520 RESIDUE VOL FLT MG/L
72/03/09	10	05							
CP(T)-G			4.050	0.2	182	78		104	
72/03/10	10	05							

STORET RETRIEVAL DATE 72/06/01

641044 M-23 F-033-84

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00058 FLOW RATE GPM	00400 PH SU	00410 T ALK CACO3 MG/L	00435 T ACDITY CACO3 MG/L	00010 WATER TEMP CENT	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00680 T ORG C C MG/L	00665 PHOS-T P-WET MG/L	00625 TOT KJEL N MG/L
72/03/08	13	20		6.80	23	6	30.0	6.3	40	12.0	0.15	2.600
72/03/09	11	30		7.10	9	4	32.0	1.2	24	4.0	0.08	0.450
72/03/10	08	30		6.70	10	4	31.0	1.0K	24	7.0	0.08	0.600
72/03/11	08	25		6.60	5	4	30.0		20	7.0	0.09	0.500
72/03/12	08	35		6.90	12	5	31.0	20.0	54	16.0	0.13	0.600
72/03/13	08	25		6.70	11	5	32.0	14.0	36	11.0	0.40	0.750
72/03/14	08	30		6.30	11	4	34.5	1.0K	17	4.0	0.06	0.570

DATE FROM TO	TIME OF DAY	DEPTH FEET	00610 NH3-N TOTAL MG/L	00630 NO2&NO3 N MG/L	00500 RESIDUE TOTAL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	00515 RESIDUE DISS-105 C MG/L	00520 RESIDUE VOL FLT MG/L
72/03/08	13	20	1.750	1.5	93	5K		93	
72/03/09	11	30	0.200	0.2	60	5		55	
72/03/10	08	30	0.250	0.1	87	11		76	
72/03/11	08	25	0.200	0.2	74	9		65	
72/03/12	08	35	0.200	0.3	79	7		72	
72/03/13	08	25	0.250	0.1	46	12		34	
72/03/14	08	30	0.300	0.3	68	7		61	

STORET RETRIEVAL DATE 72/06/01

641046 M-24 F-033-85

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00058 FLOW RATE GPM	00400 PH SU	00410 T ALK CACO3 MG/L	00435 T ACDITY CACO3 MG/L	00010 WATER TEMP CENT	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00680 T ORG C C MG/L	00665 PHOS-T P-WET MG/L	00625 TOT KJEL N MG/L
72/03/10	13	35		6.80	6	5	21.0	1.0K	1K	1.0K	0.02	0.150
72/03/13	10	45		6.30	7	4	21.0	1.0K	1K	1.0K	0.01K	0.120
72/03/14	07	55		6.50	7	4	22.5	1.0K	1	1.0K	0.01K	0.150

DATE FROM TO	TIME OF DAY	DEPTH FEET	00610 NH3-N TOTAL MG/L	00630 NO2&NO3 N MG/L	00500 RESIDUE TOTAL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	00515 RESIDUE DISS-105 C MG/L	00520 RESIDUE VOL FLT MG/L
72/03/10	13	35	0.005K	0.1	53	5K		53	
72/03/13	10	45	0.050	0.2	36	5K		36	
72/03/14	07	55	0.005	0.1	34	5K		34	

STORET RETRIEVAL DATE 72/06/01

641048 M-25 F-033-86

MONSANTO CHEMICAL COMPANY
MARCH, 1972

ESCAMBIA R. MONSANTO COMPANY
12 FLORIDA
SOUTHEAST
ESCAMBIA RIVER
1113S000 2471220

DATE FROM TO	TIME OF DAY	DEPTH FEET	00058 FLOW RATE GPM	00400 PH SU	00410 T ALK CACO3 MG/L	00435 T ACDITY CACO3 MG/L	00010 WATER TEMP CENT	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00680 T ORG C C MG/L	00665 PHOS-T P-WET MG/L	00625 TOT KJEL N MG/L
72/03/10	13	40		6.70	5	5	33.0	1.0K	43	1.0K	0.01	0.100
72/03/13	10	50		6.30	7	4	32.0	1.0K	1K	1.0K	0.07	0.100
72/03/14	08	00		6.40	6	4	32.0	1.0K	4	1.0K	0.01	0.150

DATE FROM TO	TIME OF DAY	DEPTH FEET	00610 NH3-N TOTAL MG/L	00630 NO2&NO3 N MG/L	00500 RESIDUE TOTAL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	00515 RESIDUE DISS-105 C MG/L	00520 RESIDUE VOL FLT MG/L
72/03/10	13	40	0.005K	0.1	50	5K		50	
72/03/13	10	50	0.005	0.1	41	5K		41	
72/03/14	08	00	0.005	0.1	28	5K		28	